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Volume 57

QUEENSLAND AGRICULTURAL JOURNAL

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THE HONOURABLE
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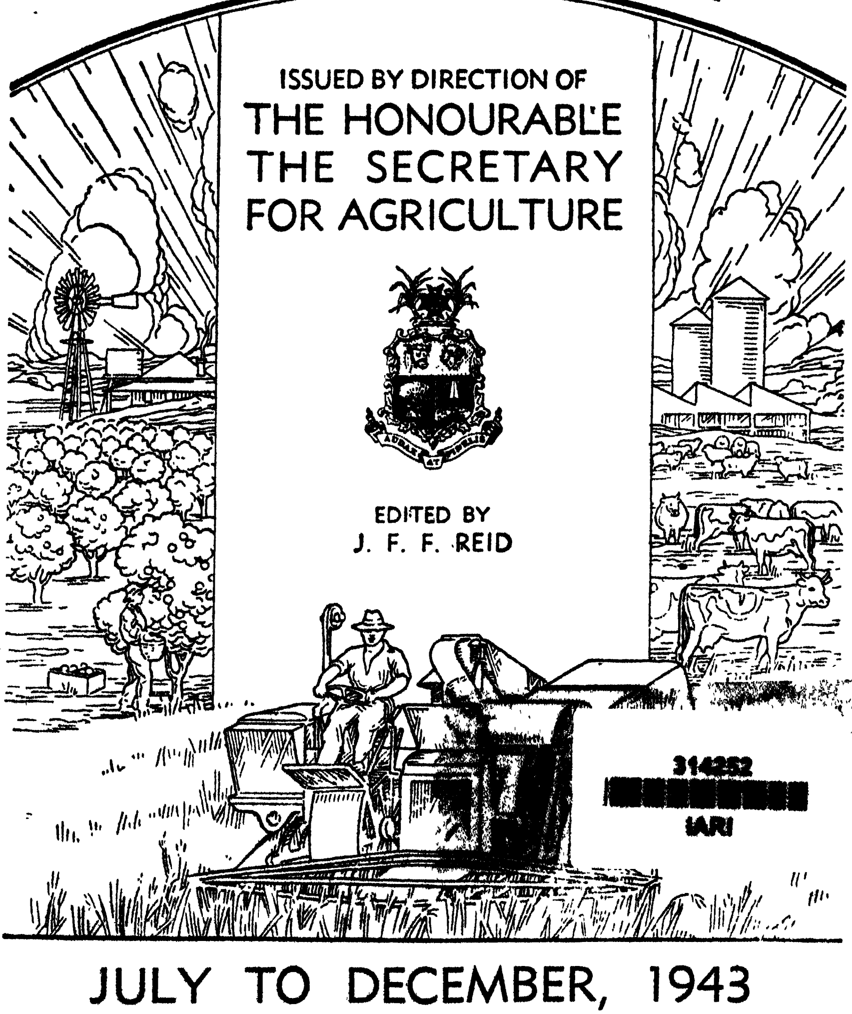

EDITED BY
J. F. F. REID

JULY TO DECEMBER, 1943

Vol. 57 Parts 1 to 6

QUEENSLAND AGRICULTURAL JOURNAL

GENERAL INDEX.

INDEX TO ILLUSTRATIONS.

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Volume 57 Part 1

QUEENSLAND AGRICULTURAL JOURNAL

Edited by
J. F. F. REID
Associate Editor
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JULY, 1943

Issued by Direction of
THE HONOURABLE T. L. WILLIAMS
MINISTER FOR AGRICULTURE AND STOCK

GOVERNMENT PRINTER, BRISBANE

Contents

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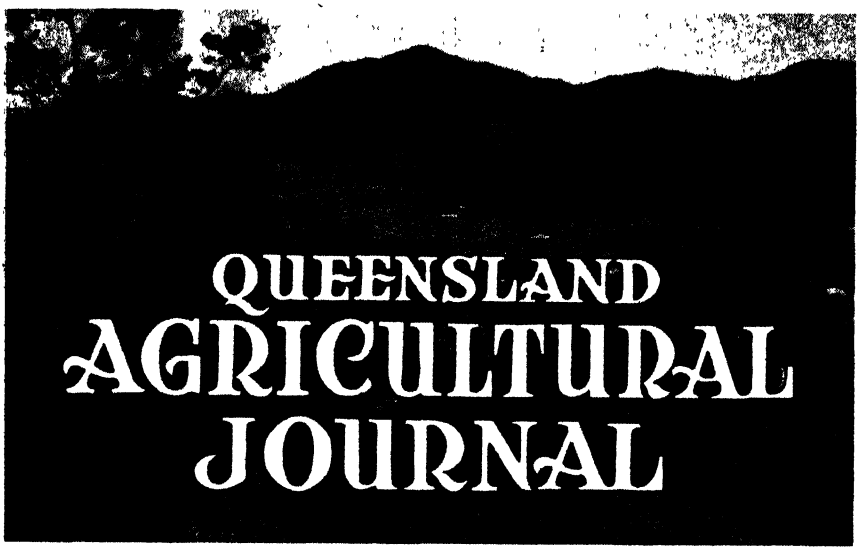
ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling**, members of Agricultural Societies, **Five Shillings**, including postage. General Public, **Ten Shillings**, including postage.



Volume 57 | 1 JULY, 1943 | Part 1

Event and Comment

The Journal—Resumption of Publication.

FIRST published in July, 1897, *The Queensland Agricultural Journal* continued without a break until and including December, 1941, when, because of the war situation, it was deemed advisable to suspend its issue indefinitely. Changing circumstances have now made it practicable to resume the publication of the *Journal*.

To conform with the present-day needs of rural industry in Queensland, the *Journal* has been redesigned to extend its practical value to primary producers generally. It is intended that the publication should be definitely a farmers' journal, to which officers of each Branch of the Department of Agriculture shall contribute short, practical, and topical articles from month to month.

Although smaller in volume because of the wartime necessity for conserving paper, popular features of pre-war issues by which the "*Q.A.J.*" became known and appreciated as a periodical of practical informational value and handy agricultural reference, will be continued.

LIBRARIANS, PLEASE NOTE!

The publication of "THE QUEENSLAND AGRICULTURAL JOURNAL" was suspended in December, 1941, because of war conditions at the time. The last completed volume was Volume LVI.—Parts 1 to 6, July-December, 1941.

After the lapse of a year and a-half, publication of the JOURNAL is resumed with this issue. It will be observed that serial numbering of volumes is continued, the present issue being Part 1 of Volume LVII., or as now shown, Part 1 of Volume 57.

Plate 1.

HON. T. L. WILLIAMS, M.L.A.,
Minister for Agriculture and Stock.

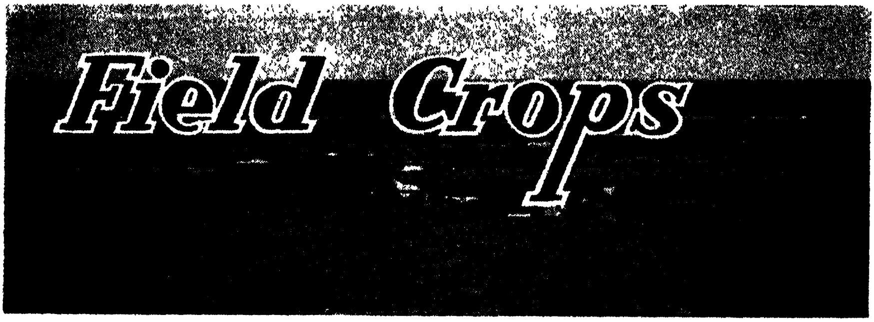
PREFACE

★

WHEN the publication of "The Queensland Agricultural Journal" was suspended in December, 1941, because of the hazardous war situation at the time, no one doubted the wisdom of the decision. The general situation has, however, changed so materially that a revision of policy in respect of departmental publications has become highly desirable.

We are faced with a food and raw material supply problem greater than at any other period in our history, while the difficulties of production and distribution are also without precedent. Cessation of imports, restriction of transport, and abnormal increases of population in certain zones have made it necessary to grow crops new to Queensland or new to particular regions. Consequently, many farmers are faced with the necessity of producing and harvesting crops with which they are unfamiliar. In such circumstances, there is a definite necessity for extending the advisory and informational services of the Department of Agriculture and Stock.

An inevitable result of wartime conditions is that greater quantities of primary products have to be produced by fewer men. Increased output is imperative, and this, in large measure, can only be attained by more efficient production. Now is the time, therefore, for increased guidance and stimulus by the Department. For that reason particularly, the re-appearance of "The Queensland Agricultural Journal" as a medium for the dissemination of information and technical advice to farmers is warmly welcomed.



Potato Culture.

C. J. McKEON, Director of Agriculture and Senior Research Officer.

PART I.

POTATOES can be successfully produced in many districts in Queensland under widely varying conditions of soil and climate; a close study of local conditions, however, is necessary to ensure success. The cooking qualities of potatoes grown in the State are equal to those of potatoes produced elsewhere in the Commonwealth, and in view of this and the fact that considerable areas of suitable land are available throughout Queensland, a much greater acreage could be devoted to this crop than has been the case in the past.

Provided soil and climatic conditions are suitable and good cultural methods are adopted, potato growing can be made a more remunerative proposition than most other crops. Growers who persist with potatoes and are not discouraged by an occasional reverse, as a result of disease incidence or low prices, find them one of the most profitable crops in the long run.

Time of Planting.

Growers in most potato-growing districts are fortunate in being able to produce two crops a year, the first of which, commonly known as the spring crop, is planted in August, the second, known as the autumn crop, being planted in February. In some districts which enjoy a partial immunity from frosts, plantings are carried out in July with a view to benefiting by the higher prices usually obtained for early potatoes. The main spring crop planting, however, is carried out during August, although in districts such as the Darling Downs planting may take place as late as September owing to the risk of late frosts occurring and injuring earlier plantings. Nevertheless, it is generally recognised that the earlier the spring crop is planted the greater are the chances of a heavy yield, providing, of course, that weather conditions are favourable. A crop planted late in spring may encounter humid weather and have a tendency to produce an over abundance of tops and a light crop of tubers. Similar unsatisfactory results may follow the use of an unsuitable variety. In North Queensland the time of planting is influenced by the incidence of the monsoonal rains and planting there does not take place until the wet season is over.

Suitable Soils and Rotations.

The ideal soil for potato growing is a friable, well-drained, alluvial loam, sufficiently rich in organic matter to absorb and retain moisture.

As a general rule, good lucerne land is also good potato land, but this is not invariably so, as lucerne can be grown successfully on the heavier types of black soil, which, unless under ideal conditions, are unsuitable for potatoes. Then, again, potatoes can be grown on some of the lighter sandy loams which could not be regarded as good lucerne land. Clay soils and soils which are badly drained and liable to become water-logged should be avoided, as not only are the chances of raising a crop small in such soils, but tubers of good shape and quality cannot be produced on them. Even on the best soils, high yields cannot be maintained, after potatoes have been grown continuously for a number of years, unless care be taken to preserve the condition of the soil by keeping up the supply of humus. This can be achieved by practising a rotation of crops and by ploughing in a green manure, preferably a legume, such as field peas for winter growth or cowpeas for summer growth. Farmyard manure, when available, is also excellent for this purpose and, like green manures, possesses considerable value as a fertilizer.

The fact that potatoes produce such satisfactory crops on well prepared virgin land, in which there is usually a good supply of organic matter, supports the belief in the necessity for maintaining the supply of humus by adopting sound farming methods. In practically all potato-growing districts a wide range of both summer and winter crops can be grown successfully, and accordingly no difficulty should be experienced in deciding on a crop rotation, to suit a particular locality.

Preparation of the Soil.

An early and thorough preparation of the soil is essential if the best results are to be obtained from any crop, but to none does this apply more so than to potatoes. Farmers who spend the extra time and labour required to bring the soil into first-class condition will be more than repaid by the improved yields obtained, especially if a dry spell is experienced during the growth of the crop. Under the most favourable conditions, good crops may be produced on land that has received a hurried and rough preparation, but in any district such conditions are likely to occur only at rare intervals, and consequently the necessity for thorough preparation of the land cannot be too strongly stressed.

The first ploughing should be to a depth of at least 9 inches, which will ensure that the seed, when planted, will have 4 inches of worked soil beneath it. The land should be left fallow for at least two months before planting, care being taken, in the meantime, to deal with any weed growth which may appear. The use of a spring tooth cultivator or other suitable implement will not only deal with weed growth, but will ensure that the surface soil is in good condition. Land prepared in this way will almost invariably be in sufficiently satisfactory condition at planting time to give a good germination of properly selected seed. If the usual practice of ploughing in the seed is not adopted, the land should receive a second ploughing, which should be at least 3 inches shallower than the first, just prior to planting.

Varieties.

The question of the most suitable variety to grow is one which the farmer will have to decide for himself, either as the result of his district's experience of potato varieties or after consultation with an appropriate departmental officer.

Carman and Factor are by far the most widely grown of the white-skinned varieties. They are high yielding and always command a good price on the market. Up-to-date also does well in some localities and comes next in order of popularity. Manhattan is at present the most popular and also the most reliable of the blue-skinned varieties In certain localities Guyra Blue also gives good results, but it does not do well in all districts. Satisfaction and Tasmanian Brownell are the most widely grown of the red-skinned varieties. Neither, however, should be planted in any quantity without a small-scale trial, as they do well only in certain localities.

Carman is among the State's most popular varieties and typical well-developed tubers of this potato always command a leading market price. There are distinct early and late strains of Carman potatoes and, furthermore, certain districts have a high reputation for the quality and trueness to type of the seed of Carman produced therein. Typical tubers of this variety have a white, smooth, or very slightly netted skin and are oval and slightly flattened in shape. The eyes are shallow but clearly defined and there is little waste in peeling. The variety yields well under favourable conditions.

The well-known Factor variety, which is commonly regarded as a strain of Up-to-date, appears to be adaptable to a comparatively wide range of soil and climatic conditions. The skin of its tubers is smooth and white and they are oval to elongate in shape, with shallow eyes. They are of good size, possess excellent table qualities, and the variety is consequently a good seller.

Another popular variety is Up-to-date, but it is not so well suited to all potato-growing districts as the three varieties already discussed. It makes tall, vigorous, semi-erect growth, and the leaves are large and of medium green colour. Its tubers are oval-shaped and have a smooth or sometimes slightly rough white skin. The eyes are shallow and are usually grouped at one end of the tuber.

There are two strains of the Manhattan variety—namely, early and late. Tubers of the common early strain are deep purple in colour with a white mottling which seldom appears in the late strain. This variety is one of the best in so far as yield is concerned and it is renowned for its hardiness and keeping qualities. Consequently, it can be grown successfully over an extensive range of soil and climatic conditions. A characteristic of the variety is its consistent ability to produce tubers of a good marketable size. The tubers are usually elongated and slightly flattened in shape, and the flesh is particularly white and close textured. The tuber eyes frequently tend to be deep and numerous but are evenly distributed.

Guyra Blue is a blue-skinned potato with white blotches, which somewhat resembles Manhattan; it is, however, usually slower in maturing than that variety. Guyra Blue plants are tall, spreading, and fairly open. Its tubers frequently tend towards a rounder shape than those of the Manhattan variety.

Several strains of the Brownell variety exist, but probably the most popular is the Tasmanian Brownell. It is particularly suited to Queensland coastal districts and under optimum conditions makes very rapid growth. The tubers of this variety are large and round and have a

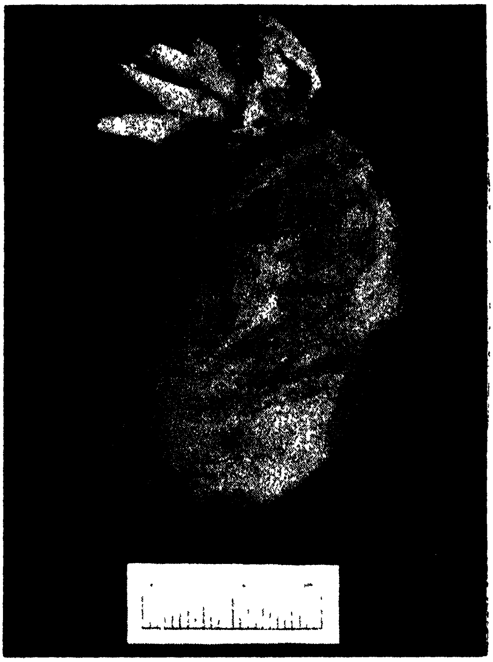


Plate 2.
WEAK, EASILY DAMAGED SHOOTS, THE RESULT OF INSUFFICIENT LIGHT.

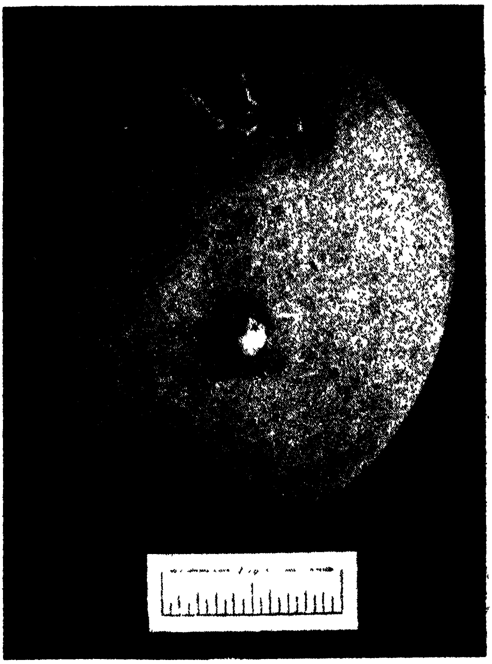


Plate 3.
SHORT, STURDY SHOOTS, THE RESULT OF EXPOSURE TO LIGHT.

rough red skin and keep well in storage. The tuber eyes are inclined to be deep, but are not very numerous, and the shoots are invariably a bright pink colour.

Bismarck is an early variety and is quick maturing. Its elongated tubers have a smooth white skin, and have numerous rather deep eyes, which are blue in colour and elliptical in shape. The crescent is long and clearly defined and the eyes are evenly distributed. This variety is popular in certain districts only.

Satisfaction, which is closely related to the Tasmanian Brownell, is a particularly attractive potato and is a red-skinned variety of good type and quality. Its tubers are large and round; they possess few eyes and keep well in storage.

Seed.

Seed has to be imported from the southern States for the spring crop, as locally-grown seed is unavailable for that crop, and every effort should be made to secure the imported seed supplies from a reliable source. It is far better to obtain seed true to the name of the variety which is known to suit the locality in which the crop is to be grown, even though it may cost a little more, rather than to obtain a cheaper line of seed which may turn out to be anything but the desired variety. Certified seed should be obtained wherever possible.

Providing the spring crop is planted early, seed from it can be used for planting the autumn crop in February. The grower should carefully select the tubers to be reserved for that purpose. Unfortunately, it is a common practice to use tubers which are the remains or culls from the crop after all marketable table tubers have been sold. Although they may be of a desirable size for planting the autumn crop, for which whole seed is generally used, it is an undesirable practice and one which has the effect of reducing yields. Many of the tubers so selected for planting will almost certainly have been produced by weakling or diseased plants, which did not produce tubers of marketable size.

The general practice in the case of other important crops is to select seed only from the most desirable plants and the same care should be devoted to the selection of seed potatoes. Growers will be fully compensated for the extra time and labour involved in selecting their seed requirements only from healthy plants which produced a reasonable number of tubers, the majority of which were of good type and of marketable size. The tubers selected for seed purposes should be stored in a cool, well-ventilated room, and should be spread out in shallow layers to promote the development of short, sturdy shoots (Plate 3) which will not rub off readily when handled and which will produce strong, healthy plants. A further advantage of storing in this way is that the tubers are less likely to rot than when stored in heaps or deep layers, and any which show signs of disease can readily be detected and immediately removed.

Seed for the spring crop may be cut, but this practice is not advisable in the case of the autumn crop, as hot, wet weather is frequently experienced during February and consequently cut seed is likely to rot in the ground. When cut seed is used, the seed should be cut a day before planting in order to allow the cut surfaces to dry. Sprinkling the cut surfaces with wood ashes is a practice which is frequently adopted and is a good one.

The best manner in which to cut the seed potatoes (Plates 4, 5, 6) will, in large measure, depend on their size, but as a general rule the smaller tubers should be cut in half lengthwise, and in the case of somewhat larger tubers the stem end should be cut off at about a third of the length of the tuber, the remaining portion being cut through the centre lengthwise, thus making three portions for planting. Still larger tubers should be cut into four sets of approximately equal size. Any tubers which are not perfectly sound, or which, on being cut, show a suspicious-looking discolouration, should be rejected.

Planting and Cultivation.

Although machines are available for planting potatoes, the general practice is to plough the seed in, the field being reploughed for that purpose, and the seed planted in every third or fourth furrow, according to the width of the plough cut. This practice has much to recommend it, as the soil and the seed in the planting furrow are not allowed to remain uncovered for any length of time, the planting and covering of the seed being practically simultaneous operations. The seed potatoes are spaced at an even depth and distance apart, the usual distance between them being 15 inches in the furrow with a planting depth of 5 inches. They should be planted on the side of the furrow to prevent the horses tramping on them, as would be the case were they planted along the bottom of the furrow. The usual distance between rows is 30 inches. As soon as possible after planting, the land should be harrowed to level the surface soil and thus conserve the soil moisture.

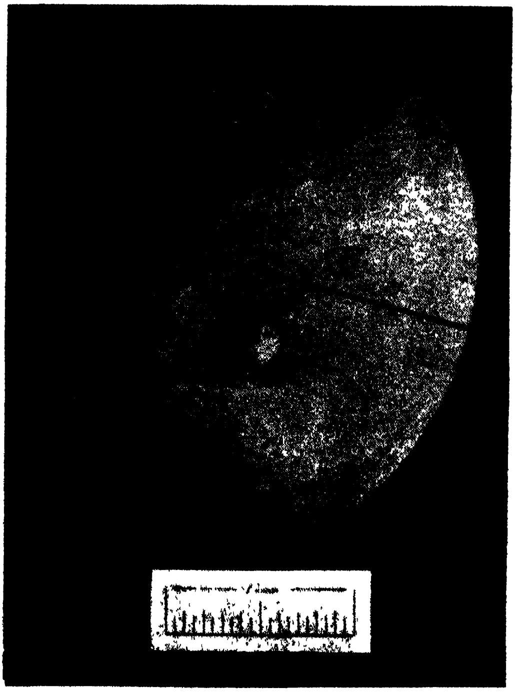


Plate 4.

TUBER SUITABLE FOR CUTTING INTO TWO SETS.

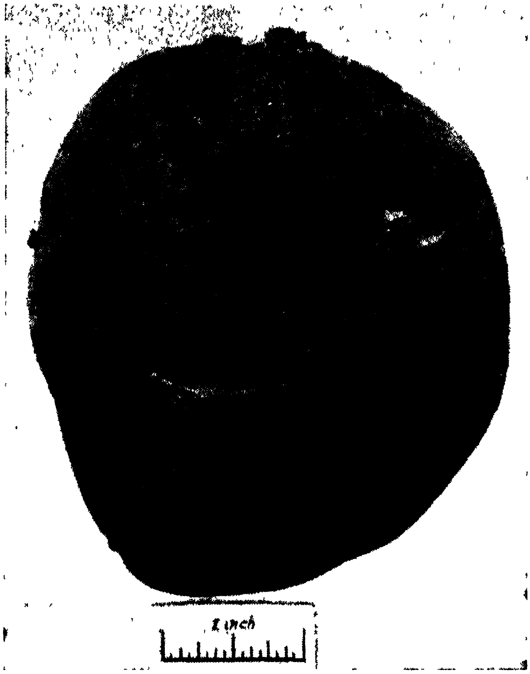


Plate 5.

TUBER SUITABLE FOR CUTTING INTO THREE SETS.

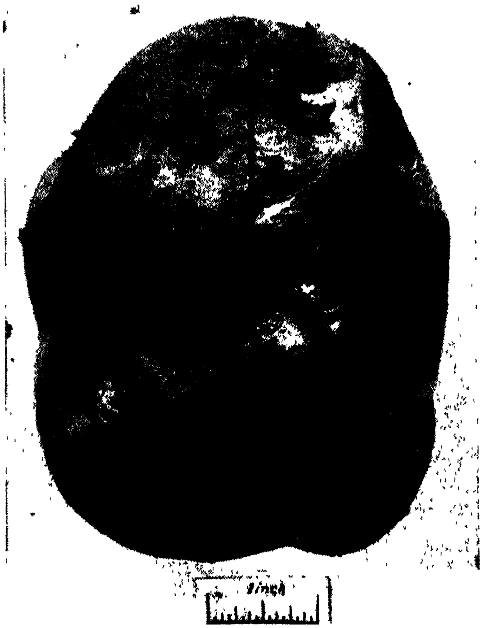


Plate 6.

TUBER SUITABLE FOR CUTTING INTO FOUR SETS.

The first cultivation should be carried out as soon as the plants appear above ground. A light tine harrow, preferably a lever type with the tines set slightly back, is the most suitable implement for that purpose. Such cultivation will not only break up the surface soil which may have become slightly caked as a result of rain following planting, but it will also destroy any weed growth which has sprung up between the plants. This will be the best opportunity for eradicating such weed growth, as all future cultivations can be carried out only between the rows. The number of inter-row cultivations will depend on seasonal conditions, but these should be sufficient to keep weed growth in check and at the same time keep the surface soil in a friable condition. Care should be taken to adjust the scuffler so that the tines do not damage the roots of the plants.

When the plants reach the flowering stage they should be hilled; an effective and popular way of doing this is by fitting hilling attachments to an ordinary scuffler. The main advantages to be derived from hilling are that it prevents tubers, which might otherwise have been exposed, from becoming discoloured, and it also affords some measure of protection against the potato tuber moth.

During growth, every reasonable precaution should be taken to protect the crop against an attack of Irish Blight, and where there is a likelihood of this occurring—i.e., during cool, showery weather—regular spraying or dusting should be carried out as a preventive.

Potato culture is dealt with fully in a recent bulletin, "Potato Growing in Queensland," which also deals with pests and diseases of potatoes. This bulletin may be obtained on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

BUSHEL WEIGHTS.

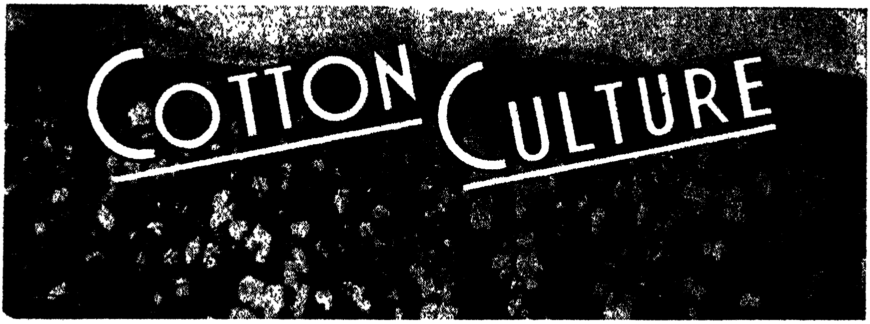
For the information of farmers, following is a list of bushel weights:—

	Lb. per bushel.		Lb. per bushel.
Barley	50*	Peas	60*
Beans	60*	Pollard	20*
Bran	20*	Prairie	20
Cowpeas	60*	Rape	56
Grass Seeds	20	Rhodes Grass	20
Lupins	60	Rye Corn	60*
Maize	56*	Rye Grasses	20
Mangel	20	Setaria	60
Meals	20	Sorghum	60
Millets	60	Soy Bean	60
Oats	40	Tares	60
Panicum	60	Vetches	60
Paspalum	20	Wheat	60*

* Indicates the legal standard as fixed by "*The Weights and Measures Act of 1924.*"

The ton is fixed at 2,240 lb. except for bran, pollard, and flour, which shall be 2,000 lb.

It should be noted that the Imperial bushel as used in Australia contains 2,218·2 cubic inches, whereas in the U.S.A. it is known as the Winchester bushel and contains 2,150·4 cubic inches.



Early Preparation of Grassland for Cotton.

L. M. HODGE, Senior Instructor in Cotton Culture.

IN many districts the carrying capacity of much of the older established grassland has become so low that renovation is urgently needed. This "running out" of grass is caused largely by overstocking, which exhausts the vitality of the better grasses, and to the gradual depletion of plant foods in the soil.

Experiments and demonstrations have shown that the best way to renovate a worn out pasture in the farming districts is to practise a rotation. This involves ploughing and cropping to something else for two or three years. Cotton appears to be an extraordinarily suitable crop to use in rotational renovation of worn out pastures in the cotton growing districts in that:—

1. It produces its heaviest yields on cultivations in the first couple of seasons following grassland.
2. It is notably drought resistant.
3. It has an assured market at a guaranteed price.
4. It is urgently needed for the country's War Effort.
5. The resown pasture flourishes when following cotton.

The question arises as to the best manner of preparing old grassland for the cotton crop.

Time of Ploughing.

The best time to plough grassland for cotton growing in the districts south of Proserpine is near the end of the summer wet period. It has been shown, however, that appreciable increases in yields over those produced on old cultivations may still ordinarily be expected where cotton follows grassland that has not been ploughed until late autumn or early winter.

Where circumstances prevent ploughing at the end of the wet season, it is advisable not to plough under a considerable amount of grass. Normally there is not sufficient moisture in the soil during the late autumn and winter to enable the soil organisms to decompose a large amount of the old dry grass that is usually prevalent at that period of the year. Consequently, if a big body of old grass, especially coarse material such as old Rhodes grass, is turned under in the winter, a very open seed bed is usually obtained. Unless an exceptionally good

planting rain is experienced, such a seed bed contributes to poor germination of the cotton seed, which will be followed by dying off of the cotton seedlings if frequent falls of rain do not occur. The lack of decomposition of the large body of turned under grass may also result in a deficiency of plant foods being experienced by the cotton plants during prolonged dry periods when they are heavily laden, especially if they are grown on soils of low fertility.

It is better, therefore, where ploughing is not done until May or June to select only grassland which has been closely grazed off so that just a moderate amount of grass stubble and weeds will be ploughed under. Given normal winter or spring rainfall a suitable seed bed can be prepared with a couple of disc harrowings and then a spike tooth harrowing following the planting rain to make a nice mulch for the planting operations. Such a seed bed will be firm enough to allow of a good germination being obtained yet will be sufficiently open to prevent any run-off of storms up to 1 inch. There will also be deeper penetration of rainfall in such seed beds than in old adjacent cultivations, thus providing more subsoil moisture for the cotton crop during stress periods.

Depth of Ploughing Grassland.

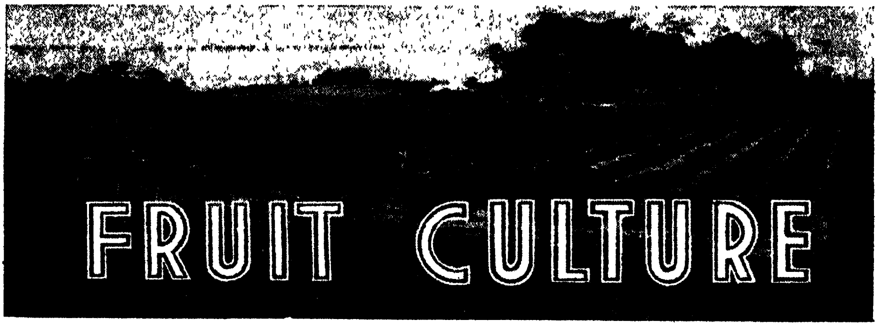
An average depth of approximately 6 inches appears to be a suitable ploughing of grassland for cotton-growing. Where the ploughing is done at the end of the wet season sufficient turn under of the long grass is obtained with this depth to rot the grass. A later cross-ploughing and a couple of disc harrowings will then prepare a suitable seed bed. For the later ploughings of the closely-grazed areas, the one ploughing of 6-inch depth is ample, providing the land is afterwards double disc-harrowed. Where a disc harrow is not available a cross ploughing will be required in about a month's to six weeks' time from the turning under of the grass, depending on the amount of moisture in the soil.

Value of the Grassland-Cotton Rotation.

The results obtained in experiments and commercial plantings over a series of seasons have indicated that it undoubtedly pays to plant cotton on land in the first or second season following the breaking up of grassland. Not only is there a greater supply of moisture provided, but there is also a better balance of plant foods available for the cotton plants. In addition, where early ploughing of the grassland is performed, there is definitely less weed and grass growth to combat during the growth of the cotton plant. The costs of cultivation are thus reduced and, as in most seasons, an increase in yield of cotton is realised compared with old cultivations—as much as 700 lb. of seed cotton per acre having been recorded—an appreciable reduction in the cost of production per lb. of seed cotton is also achieved.

Benefits are also realised in the grassland re-established following two or three seasons of renovation by cotton-growing. The cultural operations restore suitable soil conditions for profitable growth of grass of high quality for three or four seasons. A decline in both yield and quality of the grass occurs after that period. The land should be then rotated once more to cotton-growing for a couple of seasons.

Practice the grassland-cotton rotation—it increases the yields of both pasture and cotton.



Pruning Deciduous Fruit Trees.

H. ST. J. PRATT, Senior Instructor in Fruit Culture.

PRUNING has as its object the production of regular annual crops of good-sized commercial fruit over as long a period of years as possible. Guiding principles are—

1. If too great an amount of bearing wood is left, the tree will set an over-burden of fruit and will be weakened in consequence; and
2. If too little bearing wood is left, the result will be rank and excessive growth of wood with a light crop of large and poor quality fruit.

With a little experience, the orchardist will soon be able to steer a safe course between these two extremes; and by combining good cultivation and the maintenance of soil fertility with his pruning, obtain maximum results from his trees.

The Apple.

When trees are allowed to grow unpruned, it is their habit to fruit right up to the leaders; consequently, the branches are broken down with the weight of fruit, the trees fail to put on growth, they bear a heavy crop every two years and very little in the intervening years, and their commercial life is appreciably shortened. The trees do not die, but they do not pay.

The apple tree bears fruit on both laterals and spurs on the leaders. More and better fruit is, however, produced from laterals which can be kept growing, but spurs multiply and become weaker every year, necessitating tedious spur pruning. Therefore, lateral fruiting should be stimulated. During pruning, practically every lateral will require the operator's attention. Most of the previous year's laterals should be shortened. Some carrying spurs may require shortening back to a single spur to produce new growth after the fruit has set; in turn, this growth should be shortened in the following year to keep the tree growing. When a lateral remains unshortened, it bears an apple at the terminal bud and then develops spurs as far back as the vigour of the tree will permit. A 12-inch lateral would probably develop four spurs; the remaining buds would probably become barren and that lateral would cease to develop. If, on the other hand, the lateral were cut back to 6 inches or 4 inches in length, according to its strength, the terminal apple would be lost, but in the following year the top bud would put on

Plate 7.
GRANNY SMITH BEFORE PRUNING.

Plate 8.
GRANNY SMITH AFTER PRUNING.

strong growth, the second a weaker growth, and the third a "dart," and the next two or three buds would develop into spurs, all capable of bearing good fruit, which would be close to the leader or subleader with a desirable growth beyond the fruit.

In fruit trees, the last or top buds in each leader and lateral always get the most sap, the second bud gets less than the first, the third less than the second, and so on. There is, however, rarely, if ever, enough to develop all the buds on a tree, and the necessary art of a good pruner is to be able to make a quick mental calculation and know how many buds on each lateral are capable of development, and to leave only that number of buds.

The main leaders of the trees should be well defined, and nothing should be permitted to interfere with their growth. It is preferable to allow them to grow slowly upwards and slightly outwards with sturdy limbs well supplied with fruiting laterals, than to run the tree up quickly by long pruning with barren spaces devoid of laterals.

In training the trees, care should be taken not to develop too great an outward spread of leaders before the trees come into bearing. The weight of fruit will spread the leaders naturally. Too great a spread will necessitate the use of supporting props during the fruiting season.

The English or European Plum.

Many orchardists in the Stanthorpe district condemn the English plum as unsatisfactory, but the poor results obtained are often due solely to incorrect pruning.

The fruit of the English plum is generally borne on spurs on two-year-old laterals, and, because of this, the method of pruning is different to that of, for example, the peach, which bears its fruit on one-year-old

laterals. On the leader growth of each year, the plum produces a number of laterals. If these were all left untouched, they would produce, the next year, a very large crop of undersized fruit, and no provision would be made for fresh laterals to replace the old ones for the following year. The result would be, after three years, that only a few fruits would be produced at the extremities of the old laterals, 3 feet or more from the leaders. To avoid this, the correct treatment is to leave every alternate lateral the full length to produce fruit the following year; the others should be cut out at their bases and fresh laterals will then grow for the following year. As soon as the laterals have fruited and become barren, they should at once be removed to encourage fresh lateral growth.

The best fruiting woods are two-year-old laterals about 12 inches long. Very strong laterals should always be completely cut away, when the dormant buds at their base will produce new laterals. Should there be any very long laterals which make the pruned tree look shabby, they can be tipped a little, but not too much; otherwise they will only make fresh wood growth which will take another two years to fruit.

A tree which has been incorrectly pruned over a number of years and has become unprofitable can be brought into good fruiting in two or three years. Such a tree would have a lot of old laterals which should not be present. They should not be all removed, however, in the one year. As a general guide, up to one-third should be removed at their bases, another third cut back to the last growing shoot, and the balance left to produce the coming crop. In the following year the procedure should be repeated, and in three years the tree will be renovated and will, during the process, become productive.

The Japanese Plum.

The Japanese plum is a very profitable tree to grow in the Stanthorpe district, provided it is correctly pruned and the fruit is kept well thinned out. Most of the good varieties are very heavy bearers and, unless controlled by hard pruning and thinning, the fruit is of small size, resulting in too great a strain being put on the tree. The best fruit is borne on two-year-old laterals.

In pruning, care should be taken to ensure a regular supply each year of fresh laterals to replace the old ones, the spurs of which have been weakened by cropping. The most common mistake is the leaving of too much fruiting wood because, to be profitable, the fruit should be of large size. At least half of the one-year laterals should be removed entirely. If this is *not* done all the laterals on the leader growth of that year will always be the same age, whether it be one, two, three, or four years, and there will be no provision for renewals. Laterals up to 12 inches in length should be left uncut. Some pruners are inclined to tip everything, which is quite unnecessary and really defeats the object. All strong growths, other than the growth from the terminals of the leaders, should be suppressed entirely; laterals of more desirable thickness will always take their place. At the same time, an entire lack of strong growths should be regarded as a danger signal for, as previously stated, unless Japanese plums are kept growing they soon die.

The Peach.

The peach, of all deciduous fruit trees, is one that from its mode of growth and bearing requires constant pruning to maintain it as a

shapely, thrifty, and productive tree. The sap tends to flow strongly to the extremities of the shoots, more so than in any other deciduous fruit tree, and buds which do not push and form shoots in the first season after their formation are often lost; they cannot, as in many other trees, be easily stimulated into growth. Hence it is that the lower parts become so rapidly denuded of young wood and that trees improperly pruned, and more or less left to themselves for six or seven years, are to some extent worn out or useless. The fruit is borne only on the wood of the preceding year, and every part destitute of such wood is practically worthless; consequently one of the great objects of pruning is to keep all parts of the tree supplied with a regular and constant succession of annual bearing shoots.

Examination of a fruit lateral will show that it has developed at least one or two wood buds at the base, and also at the tip with fruit buds between. If that lateral were not pruned, the fruit buds would produce a lot of small fruit, while one or two wood buds at the tip would make new shoots. These growths would, however, necessarily be very weak, because of the absorption of energy by so much fruit below them. For the next season the fruit would be borne on the weak growths and there would be a long barren space entirely devoid of young shoots or living buds between the fruits and the leaders. It is in this way that the interior and lower parts of the trees soon become degarnished.

If, on the other hand, the lateral were pruned by cutting away about half its length, thereby removing the wood buds at the tip and a number of fruit buds, the sap would be concentrated in the lower part of the lateral. The fewer number of fruit buds would produce large and fine fruits, while usually two vigorous young shoots would be produced from the wood buds at the base to bear fruit next season. In this way, regular uniform crops of good saleable fruit are obtained and a constant succession of young shoots is kept up.

In the following year the procedure should be to remove the portion of wood which has borne fruit, leaving the two young shoots; and of these, the top one or the one further away from the leader should be left full length, or shortened only slightly, to produce fruit. The other should be shortened by half its length, in order to produce the new wood for the next year.

Pruning, the next and subsequent years, should follow along these lines and by this method a healthy lateral can be kept producing for four or five years by which time a new shoot will probably burst out at the base; the old lateral can then be entirely removed, the new shoot shortened, and the procedure repeated.

These are general pruning rules for peaches, but modifications are at times advisable. For example, it is not always necessary to cut *every* lateral and some may be left their full length, but they should be cut away the next year as explained.

Laterals should be well spaced, for if there are too many, small fruit and too much foliage will result. Overcrowding results in laterals being poorly developed through lack of sunlight.

In the case of neglected trees, laterals may be found bearing fruit 2 feet away from the leaders. To correct this and bring the trees back to normal, the laterals should be severely cut back to force the dormant

buds at the base into growth. As soon as the new shoots develop, or even as soon as the dormant buds swell and show signs of life, the old laterals should be removed. At the next pruning the new laterals should be shortened by half for the first year; subsequent years' pruning will then follow along the general lines described previously.

With vigorous young peach trees five or six years old, it is generally not advisable to cut the terminals of the leaders back to well-developed wood buds, but to cut back to laterals. If cut to strong wood buds, the leaders will put on another 5 or 6 feet of rank growth at the expense of the fruiting laterals below, whereas if run out to a fine point by cutting back to a lateral, the latter will act as a reducing joint and the sap will be dammed back and fruiting laterals will be forced out along the main limbs.

To rejuvenate trees with long barren leaders resulting from bad pruning, the leaders should be cut back to a lateral and fresh laterals will be forced out along the barren spaces. On no account should the leaders be cut back leaving bare stumps.

Care is necessary to control the growth of rank water shoots which may smother desirable fruiting wood but, at the same time, summer pruning should be very light.

The Apricot.

Correct pruning of the apricot is most important. Although a portion of the crop is produced on one-year-old lateral wood, most of it is borne laterally on spurs which are not long lived—about three years. Accordingly, the object when pruning should be to provide for a continual renewal of fruiting wood. Observations will show how hard each individual tree should be pruned, remembering that if pruned too hard, a lot of rank unfruitful wood will result and, if too lightly pruned, the trees will overbear, and the fruit will not reach a commercial size.

The vigour of the tree should be retained at all cost. Care should be taken to see that the spurs and comparatively thin laterals which bear the best fruit have plenty of sunlight, otherwise they will be killed outright.

Summer pruning is very necessary with the apricot. Apart from admitting the light necessary to mature the fruiting buds for the next year, it saves a severe pruning later which the apricot definitely dislikes. After the crop has been harvested, the very strong vegetative shoots on the main limbs should be removed and the leaders defined by thinning the growth at the top of the tree—the removal of this rank growth results in the sap being transferred to more profitable channels, and not being utilised in producing a lot of superfluous wood to be cut off at the next winter pruning.

All large pruning cuts should be protected with a coating of paint or coal tar to prevent the entrance of wound parasites.

The apricot is a very vigorous feeder and weeds are never seen growing near it in the orchard, therefore, to obtain the best results, soil fertility should be maintained by green and artificial manuring from the time the trees are planted.

The Pear.

Like the apple, the pear bears fruit on both laterals and on spurs on the leaders, and similarly, therefore, the pruning of mature trees is very much the same as that of the apple, except that with the latter, care has to be taken to prevent overcropping with resultant lack of growth and vigour; whereas, with the pear, if the laterals are shortened too severely rank wood growth with very light cropping will result. To prevent this short laterals should be left uncut to develop fruit spurs. In brief, provided the tree is growing normally, the pruner should cut to a spur and not to a fruit bud.

VEGETABLE PRODUCTION

Cabbage Growing.

C. N. MORGAN, Field Staff, Fruit Branch.

CABBAGE is among the more important vegetables required for both the domestic market and the Armed Services.

Cabbage is naturally adapted to cool climates and is, therefore, more favoured as a winter crop in Queensland. However, by the selection of suitable varieties, the season of production may be extended. In the coastal districts, production during the hot months of the year is usually difficult, but in the regions of higher altitude in the southern portion of the State, notably around Stanthorpe, summer production is heavy; therefore, it should be possible to produce fair crops of cabbage in Queensland practically the whole year round.

Seed-Beds.

The seed should be sown in beds of well-drained, deeply and thoroughly worked soil. If the soil in the beds is heavy, it may be improved by adding sand and decayed vegetable matter; if it is poor

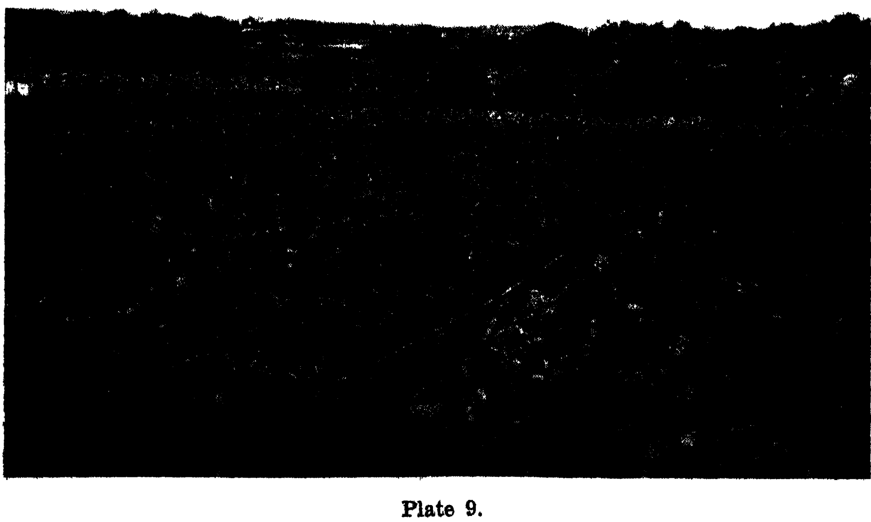


Plate 9.
A FIELD OF WELL-GROWN CABBAGE, REDLAND BAY, NEAR BRISBANE.—Note overhead irrigation system.

and sandy, the addition of loamy soil or well-rotted manure is beneficial. The soil for seed-beds should not be too rich; otherwise the young plants find their food too easily, do not develop a good root system, and are soft and may not be easily transplanted. If, on the other hand, the soil is very poor, a small quantity of fertilizer may be added to it about a week before sowing the seeds.

After raking the surface of the bed to make it smooth, it should be firmed with a flat board, and the seed then sown thinly in shallow drills, not more than ½ inch in depth and about 4 inches apart. After sowing the seed the surface of the bed should be mulched with well-rotted leaf mould, in order to retain the moisture in the soil, which is necessary for the germination of the seed. Approximately 4 oz. of seed will provide enough cabbage plants for one acre.

Seed beds should be watered regularly, otherwise the growth of the young seedlings will be checked, resulting in unsatisfactory plants. When large enough to handle, the seedlings should be thinned to about one inch apart; for, if they are grown too thickly, they develop into long, spindly, weak plants.

If it is very hot during the middle of the day, shading may be necessary, but this shade should be removed entirely as soon as the plants are strong enough to withstand the heat. Over-shading also produces long, spindly plants, which are soft and difficult to transplant.

Transplanting.

In about six weeks the young plants should be large enough for transplanting. About two or three days before transplanting they should be hardened off, by withholding water. Immediately before transplanting, the plants may, however, be given a good watering, as this will facilitate their removal from the seed-bed without excessive injury to the young rootlets. For preference, transplanting should be done during cloudy or showery weather, but if weather conditions are unfavourable, the young seedlings should be watered in; and, as a further precaution, the top half of the leaves cut off to lessen evaporation of moisture from the plants until the new root system is firmly established. At all times during transplanting the roots of the young plants should be kept damp, and this may be done by standing the plants in a bucket containing a puddle of soil and water.

In planting, usually a hole is first made in the ground with a dibble—which can be made by pointing an old handle of a spade or digging fork; this hole should be only deep enough to allow the roots of the seedling to reach the bottom. A little earth is turned in and the plant then drawn slightly upwards before pressing the soil firmly around it. This ensures that the main root shall not be doubled up.

The rows should be not less than 2 feet 6 inches apart, and the plants set out at least 1 foot 6 inches apart in the row.

Fertilizing.

The application of chemical fertilizers will do much to ensure quick and successful growth of cabbage. Before the war the Depart-

ment of Agriculture and Stock issued formulæ for the guidance of growers, by which they obtained the ingredients separately and mixed their own complete fertilizers; but, because of the war-time shortage of particular fertilizers, and the ban on the sale of certain straight fertilizers, these departmental formulæ are not now being issued. The commercial houses handling commercial mixtures, however, have good complete fertilizers for cabbage and other vegetables, and they may be purchased with confidence by growers. The grower should, however, first get his permit to purchase through the Department of Agriculture and Stock.

Whilst the rate of application of fertilizers varies in different districts, and actually on different farms—each experienced grower having his own views on the matter—as a general guide 10 cwt. to 15 cwt. to the acre of a complete mixture may be applied. The method of application is to broadcast along the lines where it is intended the rows of cabbage shall be, and to scuffle the fertilizer in a week or more before planting.

If considered necessary, after about four weeks' growth, a side dressing of from 8-10 cwt. to the acre of a quick-acting complete fertilizer may be given. At hearting, a dressing of 2-3 cwt. of sulphate of ammonia or nitrate of soda will also be of considerable advantage.

For successful cropping, cabbage should be grown quickly. Therefore, on no account should growth be allowed to be checked. It is only possible to ensure continuance of growth by regular cultivation, watering when the weather is dry, and taking care that the plants do not lack an ample food supply.

Varieties.

Selection of the right varieties for different times of the year is important. In coastal districts winter planting types should be early and quick maturing. Seed of the early varieties is sown in the autumn, but the main crop varieties are sown between August and December.

Recommended varieties are:—

Early.—*Early All Head, Early Drumhead, and All Seasons:* All of these varieties are large, early, and quick growers.

Main Crop.—*Succession* is the most popular variety, and may be grown at almost any time of the year, and in practically every district; it is a good, large Drumhead type.

Drumhead is also a good variety; it is hardy, slightly larger than Succession, and matures a few weeks later.

Marketing.

Cabbage should be marketed as soon as practicable after cutting, and only good firm-hearted vegetables should be sent in. Care in handling is essential, and when placed in bags for railing at least some of the older outside leaves should be allowed to remain, as protection for the hearts against bruising, and the heads should be packed in the bags as firmly as possible.

APPLIED BOTANY

The Sword Bean or Scimitar Bean and the Jack Bean.

C. T. WHITE, Government Botanist.

SEVERAL specimens of these plants have been received recently for identification and information regarding their edible qualities. Both have been cultivated in Queensland for some time. The Sword Bean or Scimitar Bean seems to be more abundant in cultivation than the Jack Bean, although it is regarded as of inferior quality. Seeds of either variety are not generally stocked by nurserymen.

The two beans are very similar, and by some botanists are regarded as the same species. The accompanying illustration and notes should help in recognising the differences.

The Sword Bean or Scimitar Bean.*

All the varieties known in Queensland are climbers. The leaves are composed of three large leaflets. The flowers vary in colour, but are mostly lilac, large and pea-shaped. The pod is 10-14-seeded, the valves becoming hard and somewhat woody when ripe. The seeds are red or white with a large brown hilum or scar almost the length of the seed. The red-seeded variety seems to be the commoner one in cultivation here, although the white-seeded one is of slightly better quality. A variety with white flowers has also been described, but all those noticed in cultivation here, both red- and white-seeded, have had lilac flowers.

The Sword Bean is found under cultivation through much of Asia and Africa. It has been introduced into America and Australia, but is only grown in these countries to a limited degree. In Queensland, it has sometimes been cultivated and sold under the name of Bengal Butter Bean. The young pods, when 6-9 inches long, before the seeds are formed, are prepared after the manner of French Beans, and are well flavoured and wholesome. They lack the fine flavour of French Beans, but make quite a good substitute. The plant is immune to the bean fly. It is not thought that the seeds of this variety are edible. They have been reported as poisonous in Java, and it would be unwise to take a risk with them. The plant has sometimes been recorded as a forage plant, but experience in Queensland is that it is not very suitable in this respect. As a cover crop, it has proved satisfactory in Porto Rico, and cattle are said to graze there on it to a limited extent.

* *Canavalia gladiata.*

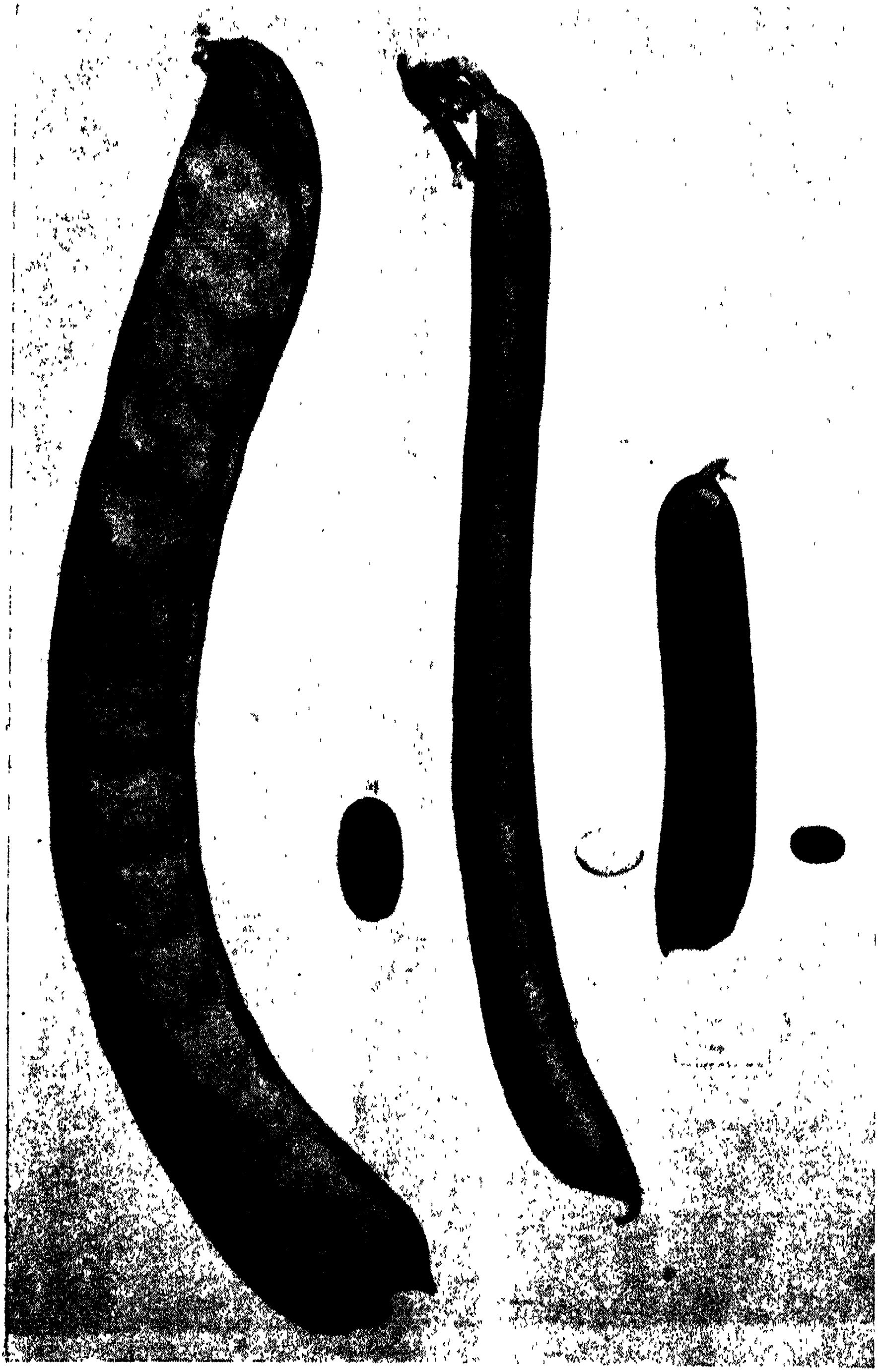


Plate 10.
BEANS AND SEEDS.—Left to right: Sword Bean, Jack Bean, and Native Jack Bean.

The Jack Bean.†

The Jack Bean is a bushy annual plant attaining a height of 4 ft., something after the appearance of a Bush Lima, but it will climb if it has an opportunity. The leaves are composed of three large leaflets and have a bitter taste. The flowers are usually purple. The first blossoms are borne near the base of the stem, so that many of the pods hang low. When mature, the pods are hard and firm and contain 10-14 white seeds, smaller than those of the Sword Bean or Scimitar Bean, and with a hilum not more than half the length of the seed. The plant is a native of the West Indies and adjacent mainland. In Jamaica it is called Horse Bean or Overlook Bean. In Antigua it is known as Babricorn Bean, and has been grown in the southern United States under the name of Pearson and Wonder Bean.

Experience with it in Queensland as a fodder crop has not been satisfactory, cattle disliking the bitter taste of the leaves. Experiments carried out at Hawaii, however, led to the claim that the reason for this was the too limited experience of its use. As with most new feeds, it is important to use only a small proportion in the accustomed ration at the beginning, and then increase the proportion gradually. It is claimed that several dairymen have fed green Jack Beans and sorghum in equal proportions to dairy cows with satisfactory results.

The young pods, about 4-9 inches long, cut into slices and cooked in the same way as French Beans, have been described as excellent in quality. The young pods are tender and palatable, but as they grow older become tough and horny. The nearly ripe seeds may be cooked and eaten in the same way as Lima Beans or Broad Beans.

The Wild Jack Bean.‡

Specimens of the Wild Jack Bean have been received occasionally. It has been recorded as injurious. Reliable reports from New Guinea and the New Hebrides are, however, to the effect that the natives use the young green pods in the same way as the Sword or Scimitar Bean and Jack Bean are used, and the nearly-ripe seeds in the same way as Lima Beans or Broad Beans without any particular preparation, and that both the beans and seeds make a palatable and nutritious vegetable. This is quite common on some coastal and near-coastal scrub areas, particularly as secondary growth. It also is frequently seen along the sea beaches; but in the absence of personal knowledge the departmental advice is to cook and taste discreetly before eating in quantity.

† *Canavalia ensiformis.*
‡ *Canavalia obtusifolia.*

Ellangowan Poison Bush.

W. D. FRANCIS, Botanist.

LIKE all other countries with extensive and varied natural vegetation, Australia has its poisonous plants. A knowledge of the harmful plants of his district often enables the stockowner to avoid sickness and losses in his herd.

The recent losses in the Clermont District of travelling bullocks through eating Ellangowan Poison Bush* brings to notice this widely-spread native shrub. In addition to the common name used here, it is also referred to in some places as Dogwood, Poison Dogwood and Turkey Bush. It belongs to a family† of plants which are widely distributed in the drier parts of Australia. The family contains altogether 138 species, and of these only a few occur outside of Australia. Other poisonous species included in the family are the Native Fuchsia‡, the Boobialla§, and the Spotted Fuchsia||. A large proportion of the species have conspicuous and decorative flowers.

Description and Distribution.

Ellangowan Poison Bush is a dark-green shrub from 3 to 10 feet high. The branchlets are round, and bear very small tubercles much smaller than a pin's head. The leaves are situated alternately on the branchlets; they measure from 1 to 2½ inches long and ⅛ to ¼ inch wide; they taper at each end, are fairly thick in texture, and are veinless except for the midrib. The flowers are single or in groups of 2-3 in the forks of the leaves, and are borne on stalks up to ½ inch long; these stalks are often curved downwards towards the ground. The flowers are white and bell-shaped, measuring about ¼ inch long. The flowers are followed by the oval, succulent fruit, which are about ¼ inch long.

In Queensland it occurs in the drier parts of the State from the Darling Downs to the South Australian border in the South. In the Central District it approaches the coast at Wood End, near Rockhampton. Clermont is its most northerly record. Jericho and Yalleroi are the most western records on the Central Line. It occurs in all the other mainland States, but is absent from Tasmania.

Symptoms and Lesions.

The effects of the plant on bullocks, as described by Mr. Kearney, Stock Inspector, Clermont, are typical of those observed in another part of the State several years ago. The affected bullocks showed evidence of severe abdominal pain, which was accompanied by trembling. In one bullock, post-mortem examination showed that the alimentary tract from the fourth stomach to the anus was full of red, blood-stained material. The abomasum showed many haemorrhages in the walls. In another bullock the fourth stomach was black, and most of the small intestine was full of black material. The dung in the large intestine was hard and apparently covered with layers of the organ, which seemed to have become detached.

* Its botanical name is *Myoporum deserti.*

† *Myoporaceae.*

‡ *Eremophila maculata.*

§ *Myoporum acuminatum.*

|| *Eremophila Latrobei.*

The principal damage by this plant, as with many other poisonous plants, occurs when stock are travelling and hungry. It has frequently been noticed that paddock stock are rarely affected by native poisonous plants, unless the climatic conditions, such as the prevalence of drought, are particularly severe.

Plate 11.

ELLANGOWAN POISON BUSH.—Specimen showing the dried fruits. The curved stalks of the fruits are shown.

"Queensland Spinach."

Dr. E. Hirschfeld, M.D., Bybera, Goondiwindi District, in a letter to the Hon. T. L. Williams, Minister for Agriculture and Stock, writes under date 3rd June, 1943—

There has been this year a good growth of herbage in the West. Outstanding from amongst this herbage, because of its profuse growth, is the Creeping Saltbush—long known as a valuable stock feed. Recognising its worth, I made it my business to learn more about this plant: its mode of growth, its habitat, and, more particularly, its rooting system. The data and specimens collected should be the starting point of further investigations, which promise to be of benefit to the pastoral industry.

There is, however, yet another aspect to this plant, which appealed to me more even than the pastoral value of the Creeping Saltbush. A few years ago I made some investigation into native vegetables, of which an account was published in the March, 1939, number of the *Queensland Agricultural Journal.* When I wrote that article, I had not tried out the Creeping Saltbush as to its fitness for human consumption. This time, with the increasing scarcity of vegetables all over Australia and the growing demand for them, I determined to test the value of Creeping Saltbush as a vegetable for human consumption.

There was no difficulty in collecting the material, as the plants were growing practically everywhere on the run. The small, light green leaves were stripped from the branches; not being handy at it, I found this part of the business rather tedious. The leaves cannot be boiled in their own juice but require more water to be added. This they take up greedily, swell up with it, and turn a dark-green colour. I had several helpings and relished them, though I must admit the other members of the household were less enthusiastic about it than I was. I ate it at three successive meals; I certainly did not notice any ill effects, neither did anyone else who had eaten it. Butter improved its taste.

Creeping Saltbush tasted somewhat like spinach. It is evidently rich in mineral salts of its own; hence required neither salt nor pepper for further seasoning.

I have named it "Queensland Spinach." This name might make it more acceptable to those who despise the home-grown article.

I submit no chemical analysis. When our known vegetables came first into use hundreds of years ago, they were adopted probably by the same rough and ready method which I employed; our cattle were the guinea pigs of the laboratory.

I have, however, substantial evidence to offer that this Saltbush of ours is a valuable food. As mentioned before, I made a special study of the rooting system, going to a deal of trouble in following up and dissecting the roots. I brought down to Brisbane with me a specimen by no means unique. This plant, apart from a dense network of roots, immediately underneath, sends out in all directions rootstems up to 4 or 5 feet in length. This means that the roots of a single plant are ranging over an enormous area, where they can scout in search of food and minerals and deliver them to the leaves. We know, moreover, that vitamins are generally associated with minerals.

This extensive rooting system of the Creeping Saltbush makes it a nuisance to the farmer in cultivated areas.

The facts I have submitted warrant further tests to be made without delay. They must probe into the value of this "Queensland Spinach." The demand for more vegetables is loud and pressing. Here is a native vegetable, growing in great abundance, and at present running to waste.

In his reply to Dr. Hirschfeld, Mr. Williams quoted the following memorandum on the subject by the Government Botanist, Mr. C. T. White:—

"I have read Dr. Hirschfeld's letter with interest. His choice of the name "Queensland Spinach" for the Creeping Saltbush (*Atriplex semibaccata*) is rather appropriate, because the plant is very closely allied to the European Spinach (*Spinacea oleracea*). This belongs to the same family and actually in the same section of it as the Queensland Saltbushes. Silver Beet, a variety of *Beta vulgaris*, also belongs to the same family (*Chenopodiaceae*) but further removed in natural classification. I would not say that the Creeping Saltbush is the best of the Saltbushes for human consumption as a vegetable, but it has the virtue that it is exceedingly common, especially on the black soil plains of the inland parts and is also common on reclaimed Brigalow-Belah country.

"Probably the best of the Saltbushes as a vegetable is the Blue Bush (*Chenopodium auricomum*), which is used fairly extensively by people in the West (especially in the South-West about Charleville, Cunnamulla, Eulo, and other places). This species is very abundant on flooded country particularly. Another one, but which I have not tried, is the Western Fat Hen (*Chenopodium auricomoides*). The use of the Old Man Saltbush (*Atriplex nummularia*) has been spoken of before by Dr. Hirschfeld and other writers. The leaves of this can be cooked or eaten fresh. When cooked, as with most others of the Saltbush Family, they should be cooked in plenty of water and without salt.

"It might interest Dr. Hirschfeld to know that at the present time we are sending to the Government Analyst, at his request, samples of native vegetables for testing for vitamin C content.

"Unfortunately, we are able to supply very few at the present time from the vicinity of Brisbane, and a feature of vitamin determination is that the plants must be fresh.

"The establishment of a plot of these native vegetables has been suggested so they could be tried in a practical way for their culinary qualities. Such a plot would yield at the same time fresh specimens tested for vitamin content."

NOTICE TO READERS.

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Address all renewals and other correspondence to the Under Secretary, Department of Agriculture and Stock, Brisbane.

PLANT PROTECTION

Potato Seed Treatment.

R. B. MORWOOD, Research Officer.

TWO methods are available for seed treatment; one, using formalin and the other, corrosive sublimate. The seed potatoes should be first washed if they have much dirt adhering. Treatment should be carried out either before the tubers commence to sprout or just prior to planting. In the latter case, they are treated before cutting. If sprouted seed tubers are dipped, some injury to the sprouts is liable to occur unless they are planted in moist soil by the next day.

Potato seed treatment, of course, cannot be expected to be productive of any real improvement in the disease situation if the soil, in which the crop is to be grown, is heavily infected with the fungi responsible for the diseases against which the treatment is adopted. It can, however, prevent uninfected soil becoming infected, and it should be of value in cases where the soil is only lightly infected. Land which has produced a crop in which tuber-borne diseases, such as common scab and black scurf or Rhizoctonia scab*, have caused severe losses should be rotated to other crops, such as lucerne, for several years, and when it is replanted to potatoes seed treatment should be adopted.

Hot Formalin.

The formalin solution is made up by adding one pint of commercial (40 per cent.) formalin to 15 gallons of water. The mixture must be then heated to 125 deg. F. and kept at this temperature during the treatment. The seed tubers are dipped into the solution for two and a-half minutes in small amounts in crates or loose gunny sacks, then taken out and the solution allowed to drain back into the treating tank, another lot of potatoes being then dipped. The treated tubers are covered with bags or canvas for one hour to keep the formalin fumes in. They are then spread out to dry before planting.

The even temperature can be maintained with steam heat where this is available. Otherwise a small fire may be built under the tank and carefully regulated, or some of the solution may be kept hot in a convenient boiler and added to the main tank as the solution cools. In any case, the temperature must be constantly measured with a good thermometer, such as a dairy thermometer, and no more than a 5 deg. variation is allowed.

* These and other potato diseases are discussed in some detail in "*Potato-growing in Queensland,*" published by the Department of Agriculture and Stock in 1942.

Acid Corrosive Sublimate.

The corrosive sublimate method has the advantage that it can be used cold, but the materials are somewhat more expensive. The solution is made up by dissolving ¼ lb. of corrosive sublimate and 1¼ lb. of hydrochloric acid (spirits of salts) in 12½ gallons of water. A wooden tub must be used as this mixture corrodes metal vessels. The tubers are soaked for five minutes, then spread out to dry. The solution can be used repeatedly but loses its strength gradually, so fresh solution should be made up after ten lots have been treated. Corrosive sublimate is a deadly poison, so great care should be taken when it is used. All treated tubers must be planted to avoid all possibility of their being consumed by any person or domestic animal.

Organic Mercury Compounds.

There are several proprietary potato dips with an organic mercury base for which it is claimed that the method of application is simpler than with formalin or corrosive sublimate. When using them the manufacturer's directions should be followed.

Citrus Gall Wasp.

W. A. SMITH, Assistant to Research Officer.

THE occurrence of swollen twigs (Plate 12) on citrus trees is a fairly common sight in the coastal areas south of Cooroy, more particularly in neglected orchards. These malformations are caused by the

Plate 12.
GALLS ON CITRUS TWIG.

citrus gall wasp, a small black insect roughly the size of the common house ant. In spring the female wasp lays its eggs in the tissues of the young woody growth, and a few weeks later these eggs hatch and give rise to small, white-coloured larvæ. During the summer months these larvæ feed on the inner tissues of the twig and interfere with the sap flow. The plant reacts by forming a gall around the insect intruders. Inside the gall each larva is enclosed in its own cavity (Plate 13), and the number of these determines the size of the gall. When full-grown, usually in early spring, the larva changes to a pupa, from which the adult wasp soon emerges and eats its way out of the gall. Adult emergence begins in September or early October—the emergence holes being slightly larger than pinholes and quite conspicuous on the surface of the galls. The female lays most of its eggs within a week of emergence.

The citrus gall wasp has been recorded from all varieties of citrus grown in eastern Australia, but lemons are most severely infested. Native species of citrus growing in coastal rain forests are also attacked. Orchards containing trees with a large number of galls are unsightly, and frequently unprofitable.

Because of the relatively sluggish habits of the adult wasp, the spread of the insect from tree to tree in an orchard, and from one orchard to another, is usually rather slow. The females emerging in spring generally select for egg-laying a young twig on the tree from which they themselves have emerged.

Plate 13.
GALL CUT OPEN TO SHOW LARVAL CAVITIES.

Three parasites of the citrus gall wasp are known, but it is sometimes necessary to supplement the work of these beneficial insects by systematically removing the gall-infested twigs during the winter pruning operations. All prunings must, of course, be burned to destroy the larvæ. The efficiency of these regular and careful prunings in controlling the pest may readily be understood when it is realised that the only living forms during winter are in the larval stage inside the galls, and that reinfestation from native citrus or neighbouring orchards is very slow. Care should be taken to remove even the small galls since any that are left will provide a source of reinfestation during the following spring.

Whiptail of Cauliflowers and Cabbages.

F. W. BLACKFORD, Assistant Research Officer.

WHIPTAIL (Plates 14 and 15) is a common disease of cauliflowers and cabbages in Queensland. The midrib and main veins on all or some of the leaves on affected cauliflower and cabbage plants are shortened, this shortening being accompanied by a curling, twisting, and puckering of the blade of the leaves, which are also very much thickened and brittle. In the case of severely affected cauliflowers, only a few outside leaves are formed, and these are very curled and puckered, and are so incompletely developed that the leaf margin is very indented. The inner leaves of such cauliflowers either fail to grow at all or remain very short and stubby; the plant does not die, but it produces no flower. Cabbages are more resistant to the disease than cauliflowers.

Plate 14.

NORMAL CAULIFLOWER LEAF ON LEFT. LEAF FROM WHIPTAIL AFFECTED PLANT ON RIGHT.

Control.

It has been demonstrated that no parasitic organism is concerned in the incidence of this disease. Tests of soil from affected areas have shown it to be acid, but this acidity can be corrected by an application of lime; and the fact has been established that, where lime has been applied to a soil which has previously grown cauliflower or cabbage crops affected with whiptail, subsequent plantings have developed normally. Growers who have, or have had, cauliflower or cabbage crops affected with this disease, and who intend liming their soil, should communicate with the Department of Agriculture and Stock, as the rate of liming varies with the type and degree of acidity of the soil. A composite sample of the surface soil to approximately 10 inches in depth should be taken from several spots in the affected field and sent in for testing. Some idea can then be gained

of the amount of lime which is necessary to correct the acidity so conducive to the development of whiptail.

Plate 15.
WHIPTAIL AFFECTED CAULIFLOWER PLANT ON LEFT. NORMAL PLANT ON RIGHT.

The method of sampling the soil is to dig a small hole about 10 inches deep and clean a face on the side of the hole. A slice of soil 3 inches thick is then removed with a spade and placed on a clean bag. This operation is repeated several times over the field, and the whole of the slices are then well mixed together, and a quantity approximately ½ lb. in weight is taken and forwarded for testing.

A QUEENSLAND AGRICULTURAL SCIENCE QUARTERLY.

Hitherto, the only medium available in Queensland for the publication of scientific and technical papers contributed by the Research Divisions of the Department of Agriculture and Stock has been *The Queensland Agricultural Journal.* This association of the science and practice of agriculture and animal husbandry in the one publication has obvious disadvantages, particularly to primary producers who are more immediately interested in crops and stock. With the exclusion of research papers from the *Journal,* the necessity for a separate publication has arisen. It is felt that this new system of presentation will be advantageous to readers, whether they are in search of information on farming practice or the scientific facts on which such practice is based.

It is anticipated that the first number of the new Quarterly will be issued in September.

Citrus Branch Borer.

A. R. BRIMBLECOMBE, Assistant Research Officer.

BRANCHES of citrus trees are attacked by several species of borers, but a fairly large one, commonly known as the citrus branch borer, is perhaps the most important of these. Dead or dying branches are typical signs of damage by this insect.

The life cycle of the citrus branch borer includes the usual four stages, namely the egg, larva, pupa, and adult. The egg is elongate-oval in shape, one-tenth of an inch in length, and yellowish in colour. From it there emerges a small, pale-yellow grub, which gradually increases to a length of about 2½ inches when full-grown. (Plate 16.) It is more or less cylindrical in shape, and the first three segments of the body are slightly larger than the others. The actual head is small, but is provided with a pair of stout jaws. Each of the first three segments bears a pair of short peg-like legs, and the remaining body segments have, on both the upper and lower surfaces, enlarged corrugated areas which grip the wall of the tunnel excavated by the grub in the infested branch and assist movements along the tunnel. The pupa is yellowish in colour and measures about 2 inches in length; all the appendages of the adult are discernible in this stage. The adult (Plate 16) is an elongate beetle about 1½ inches long and less than ¼ inch wide. The conspicuous antennæ are as long as the body. The insect is greyish brown in colour and has a sheen imparted by the fine silky hairs arranged in faintly discernible longitudinal ridges on the upper surface of the body.

Adults usually lay their eggs on twigs and small branches, probably in cracks in the bark where mechanical injury has occurred. The eggs hatch in about 10 days, and the young grubs immediately bore into the wood. They seem to prefer the centre of the branch, and make a clean-cut, cylindrical tunnel, often of considerable length. (Plate 16.) They work downwards, that is, towards the trunk. Periodically the grubs construct a dome-shaped cavity from the longitudinal tunnel, and this ends in a small opening on the surface of the branch. This seems to be used for the disposal of waste material from the main tunnel. If the branch is large, the grubs may leave the centre and work spirally down the branch just under the bark; such tunnels are commonly made by the older grubs, and may partially or completely encircle the branch. The damage is then akin to ringbarking, and usually kills the upper portion of the branch, which frequently breaks under its own weight or when a strong breeze is blowing. When its full size has been attained the grub hollows out a large chamber, 3 to 4 inches long, often in a thick part of the branch. The tunnel, both above and below this chamber, is plugged with pieces of wood torn away while it is being enlarged. Pupation occurs in the excavated chamber. It may take place as early as September, and the adults are then ready to emerge in October and November. However, development is not uniform and, while some larvæ may reach the adult stage in October, other adults emerge during summer. Mating usually occurs soon after adult emergence, and egg-laying commences shortly afterwards. Because of the long period during which adults are emerging, egg-laying is in progress throughout most of the summer months. However, there is apparently only one generation each year.

Though the citrus branch borer is a native of this country, its scrub host being the finger lime, attacks may occur on most varieties of citrus. The initial infestation in an orchard may begin on only a few trees, but if control measures are neglected, the pest may become serious within two or three years. It is doubtful whether the insects will attack sound branches; certainly cracks in the bark or pruning injuries seem to attract them. Trees lacking vigour are particularly prone to attack, and old trees are therefore apt to suffer considerable damage.

Control.

The aim of the orchardist should be to eliminate conditions favouring an attack. This is best done by efficient cultivation, manuring and pruning which are all essential for the maintenance of healthy, vigorous trees. The trees should be kept as free as possible from bark injuries, and if it is necessary to climb on them sandshoes should be worn. Pruning cuts on the larger branches should be sealed with a grafting wax or crude petroleum jelly. The trees should also be regularly examined for borer injuries; otherwise injury might not be detected until branches are dying. However, the waste material ejected from tunnels through vent holes can often be seen in time to save the branch. The grub can then be killed by inserting a piece of pliable wire into a vent hole and working it down the branch. A better method is to first plug all the vent holes, except one on the upper side of the branch, with soap or other plastic material; a little car-

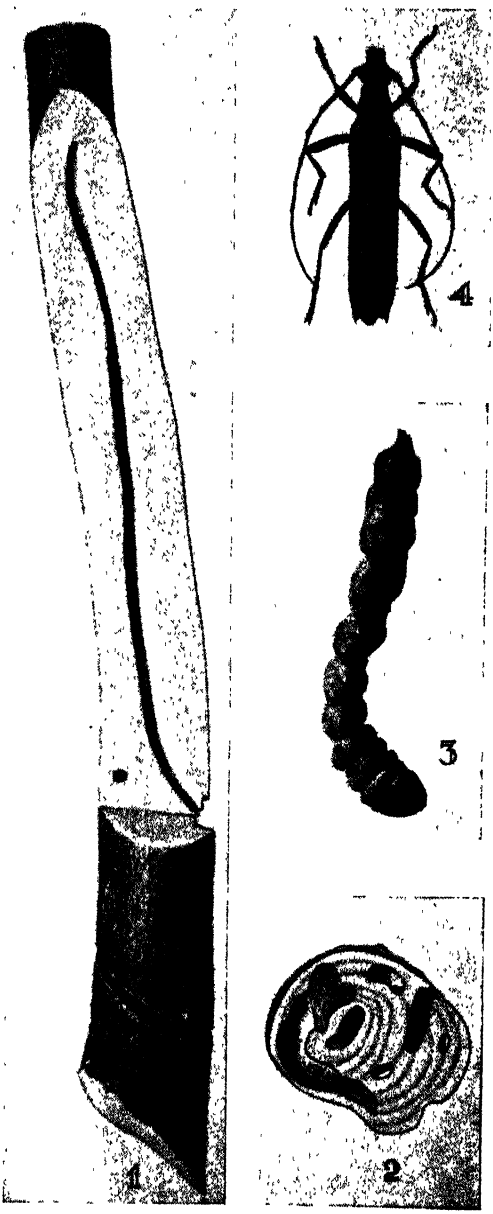


Plate 16.

CITRUS BRANCH BORER.

Fig. 1.—Branch showing larval tunnelling. Fig. 2.—Cross-section of damaged branch. Fig. 3.—Full-grown branch borer larva, natural size. Fig. 4.—Branch borer adult, natural size.

bon bisulphide is dropped into the open hole, which is then also sealed. The fumes evolved from the fumigant travel along the tunnel and kill the grub. If the branch is obviously dead or dying, it should be cut off as soon as its serious condition is noticed and the grub destroyed. The cut must be made in healthy bark tissue, but need not be below the limit of the grub's activity, provided the insect remaining in the branch is destroyed either by pliable wire or by fumigation; the cut should be sealed as in the case of pruning cuts. Dead wood, of course, should be completely removed and burned.

Though other borers attack both citrus and other cultivated trees, the control measures to be adopted are, in most cases, very similar to those just described, and can be applied with such slight modifications as the habits of the tree and the associated insect suggest.

INSECT ENEMIES OF NUT GRASS.

Certain insect associates of nut grass in Queensland were investigated some years ago, these including two small insects in the scale insect family. The more important of these, the nut grass coccid was at one time regarded as a possible nut grass eradicator, or was at least considered to be seriously detrimental to the plant, feeding as it does on the nuts and roots. The other insect is somewhat closely related to the nut grass coccid. As a result of the investigation it was found that except under dry soil conditions both insects possess little, if any, value in controlling nut grass, and if the plant be growing in a heavy soil under moist conditions, the insects have no controlling influence whatever. The larva of a weevil is a third insect, which is sometimes found associated with nut grass, in which it feeds inside the nuts. It is occasionally responsible for a local, temporary reduction in infestation in the Bowen district.

J.A.W.

Fat Lamb Raising in Queensland.

J. L. HODGE, Instructor in Sheep and Wool.

IN Queensland, in the course of the last few years the quality of fat lambs has improved considerably. This improvement has been brought about, to a large extent, by the practical interest taken by producers in the fat lamb scheme inaugurated by the Department of Agriculture and Stock. This scheme provides for the purchase of pure-bred rams of the various suitable breeds and their loan to approved fat-lamb raisers. This form of assistance continued for a period of five years. Probably the greatest benefit derived from the scheme has been in its educational value, inasmuch as farmers had demonstrated to them the very great improvement in their lambs through the use of pure-bred sires, no matter what breed was chosen. The importance of pure-bred sires in a fat lamb raising flock cannot be too strongly stressed. The matter of a pound or two in the purchase of suitable rams should be regarded as an economy rather than an expense.

Expansion of the Industry.

Numerically, lambs produced in Queensland do not compare favourably with production in the other States. There is, however, a good opportunity for considerable expansion of the industry in this State, in view of the eventual utilisation for fat lamb production of that very large area of rich brigalow and belah country stretching, with breaks, from Goondiwindi to Theodore. These lands, when improved, are well adapted for the purpose. The whole region, on an average, receives a sufficient rainfall. Clearing and the preparation of the land for cultivation is admittedly costly, but not uneconomic. In very few cases are fat lambs successfully produced on native grasses. It must, then, be admitted that cultivation is a necessity in the industry.

Unlike other parts of Australia, our rich lands respond poorly to superphosphate. This more or less rules out pasture improvement as practised elsewhere. Fodder crops for the feeding of ewes with lambs at foot, especially during the winter months, must, therefore, be regarded as a necessity in fat lamb raising in Queensland. All the cereals are recommended. In the case of wheat, the farmer may be fortunate enough during a prolific season to harvest a crop after feeding his ewes and lambs on the first growth.

The growing of sorghums for sheep has made rapid and important progress on the Darling Downs, and elsewhere in Queensland. With a cropping system of cereals and sorghums arranged at proper intervals

practically a whole year's feeding may be provided if the season is average or better.

The Need For Uniformity.

Regarding the whole State's production as a seasonal drop, more uniformity in the lambs should now be looked for. Experimental periods are passed, and farmers should avail themselves of the knowledge of breeds and crosses gleaned over a long period of years.

Points in Breeding.

Suitable crossbred ewes are hard to come by, and very costly, too, when located. Corriedale ewes are hard to beat, but they, too, are costly. With merinos preponderating to such an extent in the State, it will be presumed that growers must make a start with this breed. The largest and most robust type should be chosen. With these should be joined one of the long wools—Border Leicester, the Romney Marsh, or the Lincoln. All produce excellent ewes for the purpose of breeding fat lambs. Of the resultant drop, the ewe lambs should be saved as the future mothers in the fat lamb flock. The wether lambs should be disposed of as fat lambs. On these crossbred ewes, when mature, should be used one of the Downs type of ram. Both the Southdown and the Dorset Horn have proved themselves excellent for Queensland conditions. The whole drop should be marketed. With correct feeding conditions a crop of lambs bred the right way should be ready for market at 12 weeks or a little later.

It is a good idea when joining Southdowns or Dorsets to introduce also one or two of the long-woolled type of ram, for the purpose of breeding a few ewes of the type required for replacements each year. There was a time when it was customary to say that the wool from a lamb-rearing flock was of quite a secondary consideration. With the enhanced demand for crossbred wools, and the prices such wools are bringing, that saying no longer applies.

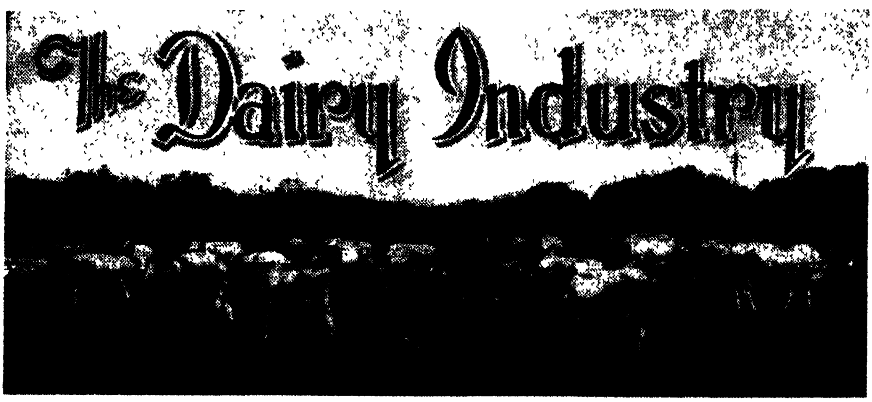
Pure Corriedale wool with plenty of character brings an excellent price nowadays, and the same may be said, to a lesser extent, of the crossbred wools derived from crosses recommended in the ewe flock.

Money in Fat Lambs.

From a financial point of view there is no quicker money in the whole of the sheep industry than in the successful production of fat lambs. Over the past five or six years the prices received in Queensland for true sucker lambs have compared more than favourably with Southern returns. Just at present, because of war conditions, there is a ceiling price, but this is generous, and leaves plenty of margin for profitable returns to the grower.

Marketing.

In the marketing of lambs, the greatest care should be exercised. Avoid trucking them when in a heated condition. Remember, a prod with a stick leaves a bruise in so tender an animal, with the probable rejection of the carcase. Do not lift a lamb by the wool; this, too, bruises. Never overcrowd the truck. In fact, take every care so that a consignment may arrive at the yards carrying the bloom so necessary for top prices.



Food and Fat Percentage in Milk.

E. B. RICE, Director of Dairying.

INQUIRIES are often received as to the effect of certain foods on the fat content of milk. To simplify discussion, it is proposed to deal with the subject under three headings, viz.:—

(1) The feeding of an adequate and balanced ration—i.e., normal feeding.

(2) Abnormal feeding, resulting in the animals receiving a deficiency, or an excess, of certain nutrients in the diet fed.

(3) The influence of the condition (feeding) of the animal prior to the lactation period.

Normal Feeding.

Numerous investigations in many countries have demonstrated that in herds of cows given an adequate and balanced ration, changes in feeding can at most cause only a slight and temporary change in the fat percentage of the milk yielded, and that a permanent increase in the fat percentage of milk by this means cannot be obtained. Even the excessive feeding of fats and oils to cows will not cause a permanent appreciable increase in the fat percentage in their milk. In fact, cod-liver oil feeding has been found to depress the fat content, the depression continuing for some time after the oil is omitted from the food.

It is to be clearly understood that these notes deal only with the influence of feeding on the actual percentage of butterfat in milk. Undoubtedly, by increasing (up to a level depending on the individuality of each animal) the quantity of nutrients fed—particularly protein-rich concentrates—it is often possible to effect a pronounced increase in the total quantity of milk and, consequently, fat secreted; but the actual percentage of fat in the milk still remains constant, irrespective of whether a cow is fed to produce the maximum quantity of milk of which she is capable, or less than this amount. This is because the fat percentage in the milk of each individual animal is an inherited characteristic, depending chiefly on the breed of the cow and, within any particular breed, on whether the family from which she is descended possesses the capacity of yielding milk above or below the average fat percentage of the breed.

Although by milking cows at unequal intervals of time, there may be a difference in the fat content in the morning's and night's milk, if the mean test for the two milkings in twenty-four hours be taken, it will be found that the tests will not vary to any appreciable extent from day to day in the bulked milk of a herd. Individual cows may, however, sometimes be found which show a tendency towards daily fluctuations in the fat percentage in the milk yielded by them, but in the bulked milk of a herd the daily difference should be inappreciable. There is, of course, a seasonal variation which is normal and which in Queensland averages about 0·3 per cent. between midsummer and midwinter milk, the latter being of the better quality.

Abnormal Feeding.

Apart from normal feeding methods, investigations have also been made concerning the effects of various kinds, quantities, and qualities of food on the fat percentage of the mixed milk of a herd. Some of these will now be discussed.

(*a*) *Increasing the Plane of Nutrition.*—Suddenly increasing the milk yield by changing to a better balanced and/or more adequate ration may temporarily decrease the butterfat percentage. Continuous overfeeding will improve the condition and maintain yields, but does not cause a permanent increase in fat percentage. A change from overfeeding to feeding a normal balanced diet may decrease the yield and temporarily increase the fat percentage.

(*b*) *Lowering the Plane of Nutrition.*—A sudden change to a ration which decreases the milk yield sometimes temporarily increases the fat percentage. A deficiency of any constituent needed in the food supply of a cow does not usually cause an immediate falling off in milk yield or appreciable change in fat percentage, for the cow will continue to maintain the yield by drawing on her body reserves for the constituent lacking in the diet. Only when the body reserves have been depleted to such an extent that health is endangered will the milk flow be reduced. Prolonged underfeeding is, however, likely to result in a diminution in fat test and, of course, a greatly lowered yield.

(*c*) *Inclusion of Oils and Fats in the Ration.*—Claims to have effected temporary increases in fat percentage by feeding oils and fats have sometimes been reported. Possibly such increases were due, not to the oils and fats themselves, but to abnormal feeding. Some cows may be quite unaffected by these feeds. In any case, as any increase in fat percentage would not justify the cost of such feeding practices, they must be condemned as wasteful. It has been previously mentioned that some fats actually depress the fat percentage; experimental feeding of codliver oil at the rate of 6 oz. per cow per day definitely reduced the fat content. Similar results with herring oil were obtained in some American feeding investigations. On the other hand, there is experimental evidence from Victoria of the effect of meat-meal, fed at the rate of 1¼ lb. per cow, causing an increase in the butterfat content of milk for a period of three months; possibly because of the correction of a protein deficiency.

Condition of Cow Before Commencing Lactation Period.

The condition of the cow before calving materially influences the fat percentage and the yield of milk in the ensuing lactation period. A cow, if fed well in the months prior to the oncoming lactation and

fit at calving time, will maintain its milk yield better throughout the lactation than if she calves in poor condition; and, furthermore, a higher test will be maintained. It is desirable particularly for the cow to be dried off and adequately fed in the six to eight weeks before calving, in order to prepare for the heavy demand on its constitution in the approaching milking period. The noted English authority, Dr. John Hammond, in a report on a comparatively recent visit to Australia, said in this connection: "If cows are going back in condition in the last six weeks or so before calving, the whole lactation (especially for first and second calvers which are making body growth also) will be lowered; extra food given at that time will have more effect on the total output of butterfat in the lactation than it will during any part of the lactation period itself. The feeding of calcium phosphate during this period, to obtain a body storage for the subsequent lactation, is also frequently neglected." Thus, if a cow calves in poor condition through underfeeding (and particularly in the last six weeks or so of pregnancy), even if well fed after she again freshens, she will be incapable of yielding to her fullest capacity during that lactation period. This is a matter worthy of consideration on many Queensland farms where the dry stock are kept in "dry paddocks" (usually with inferior pasture) until the calving date is nearly due.

HOW TO PRODUCE CHOICE CREAM.

E. B. RICE, Director of Dairying.

Dairy buildings and equipment of a reasonable standard are conducive to efficiency in the routine of a dairy farm, but much can be achieved even with limited facilities, provided every care is taken which skill and experience suggest. There are, however, two primary requirements for the production of cream of high quality—

(1) An abundance of water.

(2) Adequate facilities for boiling water; a 12-gallon copper (or its equivalent) provides the minimum requirement.

On many farms on which low quality cream is consistently produced these essentials are often lacking. They should be given priority over all other considerations by any producer whose limited financial resources may only gradually enable him to bring his premises into conformity with the Dairy Regulations.

The rules of dairy hygiene set out below have been prepared with the object of assisting in the production of choice quality cream. By studying the rules, and then by strictly amending any practices found to be at fault, any supplier of low-grade cream should be able to improve the quality of his cream immediately.

Rules of Dairy Hygiene.

1. All milking cows should be sound and healthy.

2. Freshly-calved cows' milk should not be separated until 10 days after calving.

3. Before milking begins, rinse with clean water all cream cans and utensils (including milking machine, if used). A weak chlorine solution is recommended for the rinsing.

4. Wash udders and teats with a cloth moistened in water in which there are a few crystals of Condy's fluid; or use a weak chlorine solution. Keep enough cloths to enable each to be replaced as it becomes soiled.

5. Test the foremilk of each teat to observe if the milk is normal. Keep a separate small vessel for the foremilk, which, if sound, may be subsequently fed to pigs, or rejected. A piece of black cloth fixed over the strip cup helps in detecting clots, presumptive evidence of other trouble.

6. After milking, wash, scald, and hang udder cloths to dry in a dust-free place.

7. Wash the hands before and as often as necessary during milking. Provide soap, water and towels for this purpose. If possible, practice dry milking. Do not "lubricate" the hands with milk. The personal factor often is the weak link in clean milk production.

8. The sterility of utensils is the most important single factor in dairy hygiene. Thoroughly clean and near-sterilize all utensils after use in the following way:—

(*a*) Immediately after milking, first rinse utensils with plenty of cold water to remove all remnants of milk and cream.

(*b*) Then wash utensils thoroughly (both inside and outside where necessary) with fairly hot water in which washing soda or other cleanser has been dissolved. This makes the utensils physically clean.

(*c*) Then steam the utensils or immerse them in boiling water. "Scalding," which is the usual final step on most farms, is only efficient if plenty of boiling water is used. The utensils should then be near-sterile.

(*Note.*—For a milking machine, steam is necessary for effective final sterilization. Likewise, in cleaning, at least one gallon of water per unit is required for the preliminary cold water rinse and the hot cleansing solution.)

(*d*) Allow utensils to drain and dry in an inverted position on a metal draining rack situated in a dust-free atmosphere; if desired, the rack may be in a sunny position. Do not use a cloth to dry dairy utensils.

9. Use good quality brushes and not wash-up cloths for dairy cleansing. Wash and sterilize the brushes daily after use.

10. Regularly dismantle and thoroughly clean and sterilize the milking machine.

11. Flush out and effectively steam at least twice weekly the airline of the milking machine.

12. Immediately after separation, cool cream to as low a temperature as practicable and make every effort to keep it cool until despatched to factory.

13. The proper blending of cream from different milkings is important. Do not mix warm with cold cream until the animal heat has been removed.

14. Unless held at a low temperature in a mechanical cooler, stir cream with a metal stirrer from time to time while it is held on the farm.

15. Thoroughly cleanse all cream cans returned from the factory before again using them for cream.

16. Adjust cream screw on the separator to give cream of a 40 to 44 test in summer, and at least a 36 test in winter.

17. Send cream to factory as often as practicable. The summer objective should be daily delivery.

18. Maintain cream cans, all other utensils and equipment, especially milking machine rubberware, in good repair and, when necessary, promptly make renewals or have the cans re-tinned.

19. Sweep and wash down bail floors daily.

20. Remove manure from cowyard daily and endeavour to abate the dust nuisance.

21. Keep the milking shed and dairy tidy. As required, repaint and limewash buildings. Use the dairy house exclusively for dairy produce and not as a general storeroom.

22. Protect dairy produce at all times against contamination from flies, dust, odiferous substances and exposure to direct sunlight.

23. Kindness in "breaking in" a heifer repays itself by the behaviour of the animal throughout its milking life. Do not tolerate noise or rough handling of animals in the milking shed. Nervous or fractious cows are detrimental to cleanly shed practices.

24. Do not "set" dogs on dairy stock.

25. Feed cows on milk-tainting fodders, such as lucerne, immediately after milking and remove the milking herd to pastures at least three hours before the next milking period.

LIMEWASHES FOR DAIRY BUILDINGS.

Limewashes recommended as suitable for milking-sheds, bails, stables, and all outside work, and as a cooling compound for roofs:—

1. 20 lb. lime (unslaked), 30 lb. common salt, ½ lb. alum.

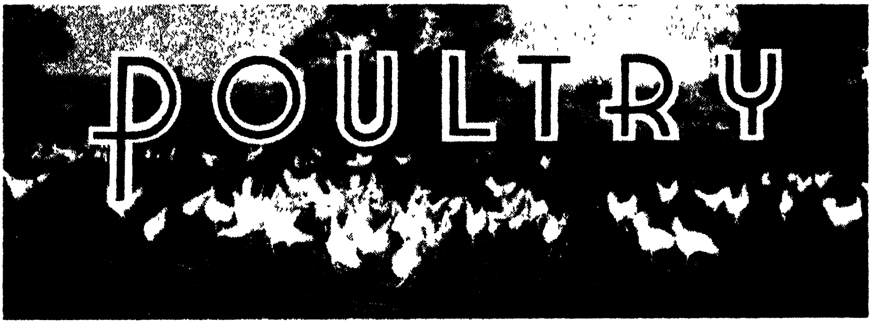
Slake the lime with boiling water until the consistency of the wash is similar to thin cream. As an antiseptic, add ½ pint of crude carbolic to each bucketful of wash.

2. To half a bucket of lime add two handfuls of common salt and two handfuls of tallow. To make two bucketfuls of wash, slake slowly with cold water, stirring continuously. The germicidal value of the wash may be increased by adding ¼ lb. of chloride of lime to every 30 gallons of wash.

3. Slake lime with water and add enough skim milk to bring it to the thickness of thin cream. To each gallon add 1 oz. of salt and 2 oz. of brown sugar or molasses dissolved in water.

Before applying a wash to wooden, metal, or stone structures surfaces should be thoroughly cleaned.

For inside work in dairies and factories, instead of limewashes, reliable sanitary paints are recommended.



Rearing Chickens.

P. RUMBALL, Poultry Expert.

THE hen herself shows what is necessary in brooding. She regulates the heat requirements of her chickens according to their age and the weather. When her clutch is very young she does not move about much, sits often, and extends her range gradually as the chickens grow. On a cold, wet day, she collects her brood frequently and warms them. In brooding, similar principles apply, but with this difference: the chickens have to be trained to do for themselves.

Two systems of brooding are common in Queensland—cold brooding and heated brooding. With both systems many types of brooders are used.

Cold Brooding.

The term "cold brooding" is a misnomer. Artificial heat is not supplied, but the heat of the body of the chicken is retained by means of cloths or flannel and a restricted circulation of air. This system of brooding has been practised for many years, but it is only in recent years that it has been used to any great extent by commercial poultry farmers. The cold brooder may be operated in brooder houses or rearing pens with an equal degree of success. Although the writer has operated the cold brooder with apparently equal results to the heated brooder, the latter is favoured. It can well be understood that the placing of chickens which have travelled a day or so under a cold brooder warmed up with their own bodily heat, will not give as good results as a heated brooder. Also, in cold, bleak weather the heated brooder offers obviously greater advantages.

Heated Brooding.

There are many types of heated brooders, including the box, the colony, and the battery brooders. The firstmentioned type is not used to any extent in Queensland, because of, perhaps, the cost of installation of a suitable type, or because of the general satisfactory results obtainable from the colony system.

Colony Brooder.

Where large numbers of chickens are to be reared the colony brooder is the most economic. With this type of brooder, hundreds of chickens can be run together with little more trouble and attention than would be required for a lot fewer under any other brooding

system. This system also permits of much freer movement of chickens once they have become sensitive as to the source of warmth. Three hundred chickens should, however, be the limit in any one colony brooder. It is also usually a sound rule to depreciate the capacity claimed for brooders by most manufacturers.

The colony brooder consists of a heater with a metal hover for the purpose of deflecting the heat. The fuel used may be coke, sawdust, kerosene, or electricity. It is possible to operate them in open-fronted houses by cutting off ground draughts, but if that is done more fuel will be necessary.

A suitably-sized building to house a 500 colony brooder would measure approximately 14 feet by 16 feet, and at least 6 feet high. The roof may be either a hiproof or skillion. The building should be lined and ceiled and provided with ample light. It should be built to face north-east or north and so that sunlight may be freely admitted. Lighting through glass may be desirable in bad weather, but direct sunlight is much better.

Temperatures.

In heated brooders, temperature is a very important factor. If not warm enough, the chickens crowd together, and correct heating is the only way to prevent this. Overheating should also be avoided because of its weakening effect and difficulty in weaning from the brooders. The general comfort of the chickens is a sure index that the temperature is fairly satisfactory, and if the droppings are well distributed under and around the hover in the morning, it is proof that the chickens have been fairly comfortable. When the chickens are first put into the brooder they come from a nursery in the incubator which generally has a temperature of at least 90 deg., and it as well to start brooders at this temperature and reduce the heat gradually until it is no longer required—say, in from four to six weeks.

The importance of heat in brooding chickens has been demonstrated by investigators at the Michigan State College (U.S.A.). Working with chickens from disease-free stock with a range of temperature from 72 to 96 deg. during the first week of brooding, mortality decreased from 37 per cent. to 5 per cent., and with diseased stock from 57 per cent. to 32 per cent. These experiments were conducted over a period of two years and amply illustrate the importance of temperature.

Ventilation.

With some types of brooders, many chickens are lost because of lack of ventilation and overcrowding. Brooders which are usually made to hold 100 day-old chickens are generally too small for the same number of chickens a week old. It frequently happens also that no allowance is made for additional ventilation with the growth of the chickens. The lack of ventilation has a great weakening effect on both very young and older chickens, causing the very young ones to crowd, and rendering the older birds more susceptible to disease. When chickens have crowded, they present a wet appearance in the morning, to which the term "sweating" is applied. Sweating is not the cause. The wetness is caused by the condensation of the chickens' breath, which would not have happened if proper ventilation had been provided. Chickens which have been overcrowded rarely recover from the ill-effects, so overcrowding should be strictly avoided.

In brooding under any system the following are essential points:—

(1) Limited range, increasing with age.

(2) Sufficient heat, which should be reduced as soon as possible.

(3) Ventilation, which should increase with age.

(4) Correct accommodation. What may be just enough room for 100 day-old chickens rapidly becomes too little as they grow.

(5) Never attempt to brood chickens of mixed ages.

Placing Chickens in Brooders.

When chickens are placed in brooders, the floors should have a light dressing of sand or soil to absorb any excreta and give the chickens comfortable footing. A small amount of litter in the form of soft straw or chips will provide exercise and prevent vice. With both hot and cold brooders, their liberty should be restrained for a start. This can be done by erecting a barrier of wire netting around the brooder, increasing the area day by day. At the end of about one week they may be given the liberty of the brooder house. With the cold brooder, the netting should only allow a range of two or three inches for the first day. With the colony brooder, the range will depend on the heat given off by the brooder. Chickens should be taught to know where the heat comes from, and taught to become "conscious" of the source of heat, and when this is done they should be encouraged to take as much exercise as possible by ranging over the entire brooder house.

Most breeders have outside runs to their brooder houses, and the chickens are allowed out when they are about a week old. Outside runs are not essential if the brooder house is so constructed as to permit of abundance of light and sunshine. However, when runs are provided the chickens should be driven back to the brooder after they have been out for an hour or so on the first occasion. They may be allowed out again in the course of an hour or so. This should be repeated in order that the chickens will learn to return to the brooder house and avoid to a large extent the possibility of their being caught out in a rainstorm or staying out too long and becoming chilled.

Cleanliness in every operation is essential; unsanitary conditions not only pollute the atmosphere of the brooders but are frequently the cause of the rapid spread of serious diseases in baby chickens.

ANIMAL HEALTH

Worms in Calves.

G. R. BRETTINGHAM-MOORE, Veterinary Officer.

MATURE cattle are, as a rule, little affected by parasites which take a heavy toll of calves. Much can be done to lessen both the incidence and effect of worm parasites. Special stress is laid, therefore, on attention to the following preventive measures:—

Preventive measures are designed to reduce the chances of the animals becoming infested. They are based on the knowledge of the life histories of the worms, and of the conditions in a pasture which favour the development and survival of worm eggs and larvæ. As calves and yearlings are most susceptible to infestation, they should be given first consideration when putting the undermentioned principles into operation:

1. Avoid damp, low-lying pastures. Moisture is essential for the development of worm larvæ, and also assists greatly in their survival. Such pastures, if it is impracticable to dry them out, should be used only for grown cattle.

2. Drinking water should be supplied in troughs. Shallow stagnant pools are a dangerous source of infestation, particularly when the pastures are dry, for at such times the animals concentrate on the green feed around them, thus heavily contaminating the ground.

3. Stock as lightly as possible. Overstocking is one of the most common factors predisposing to outbreaks. It stands to reason that the more animals there are in a pasture, the more contaminated the pasture becomes and the greater the chances of the animals becoming infested.

4. Avoid permanent pastures for young stock. Calves and yearlings should, if possible, be run on pastures to which cattle have not had access for at least three months. Such pastures while being spelled from cattle may be grazed by horses, for the worms that occur in horses do not infest cattle, and *vice versa*. If spelling is not possible, pastures for young stock may be cleansed of much of their infestation by firing. Firing of pastures, however, should not be given preference to spelling.

5. The state of nutrition of an animal greatly influences the degree to which it can withstand the effects of an infestation. A poorly-nourished beast is much more susceptible than one in

good condition. Young animals on being weaned should, then, be reared on an adequate and well-balanced ration. During dry periods, all young stock should receive supplementary foods, which may be supplied either by improved pastures, cultivation, or by hand feeding. A good lick will do much to keep the animals healthy. A useful lick may be made up as follows:—

Sterilized bone meal	70 parts
Coarse salt	25 parts
Limonite	5 parts

6. Dairy farmers should keep the calf pens and yards clean and in a sanitary condition.

Symptoms.

The following general symptoms are common to most types of worm infestation:—Unthriftiness, loss of condition, diarrhœa, pale membranes of the eye and mouth and, in advanced cases, "bottling" under the jaws. The diagnosis should be confirmed by killing a badly affected calf and searching for the worms, as described later. A condition of anæmia similar to the foregoing, but without the scouring, may be produced by a heavy infestation of ticks, which should not be overlooked when making a diagnosis.

The large stomach worm or "barber's pole worm" is one of the commonest and most harmful found in calves. It is a blood sucker and inhabits the fourth stomach. Symptoms of infestation are particularly those of anæmia with pale membranes and weakness, although scouring may not be present. There is swelling under the jaws, harsh coat, and rapid loss of condition. The worm measures up to 1¼ inches in length, and is red and white spirally striped.

Examination of the contents of the fourth stomach usually reveals a heavy infestation, or a glass jar may be half filled with ingesta of the fourth stomach, and in a few hours any worms present may be seen crawling up the sides.

It is again necessary to stress the importance of the preventive measures before-mentioned. However, if the calves are affected the following drench should be given:—

Bluestone	1 lb.
Water	2½ gallons.

Dosage.

Calves—

2 to 4 months—1½ to 2 fluid oz.
4 to 8 months—2 to 3 fluid oz.
8 to 12 months—3 to 4 fluid oz.
12 to 18 months—4 to 5 fluid oz.

The dose should be repeated in ten days, and thereafter as often as necessary. Bluestone should only be mixed in enamel, earthenware or wooden vessels because of its corrosive action on metals. Where worms are troublesome in spite of all precautions, it is sound practice to drench all calves in January and April, and again in June or July. By this practice, the infestation picked up in the summer is got rid of before its effects begin to be felt in the winter.

Strangles.

G. R. BRETTINGHAM-MOORE, Veterinary Officer.

STRANGLES is an infectious disease which usually attacks young horses. Natural infection is most common by its characteristic nasal discharge which may contaminate fodder, water, or any materials, such as grooming brushes or clothes, with which it comes in contact.

Predisposing Causes.

Exhaustion, whether due to overwork or bad conditions and crowding together, such as occurs in remount depots, and trucking long distances, all lower the resistance and favour an outbreak.

Symptoms.

Horses are generally off feed for a day or two before anything else is noticed. Then follows a nasal discharge which at first is clear, later becoming yellow and thick, accompanied by a rise in temperature. In a day or two a painful swelling under the jaw can be felt. Breathing is interfered with, and there may be frequent coughing. In uncomplicated cases this swelling comes to a head in a few days and bursts or may be lanced and, as a rule, the animal is well again in a week or so. In other cases (bastard strangles) the abscess may not point and the whole head swells to a very large size. In another type, the infection appears to become generalised. Both these types may end fatally.

Treatment.

Drenching is never permissible because of the inability of the horse to swallow easily. The swelling under the jaw may be induced to come to a head by rubbing in a blister such as—

Red oxide of mercury	1 part
Vaseline	8 parts

The abscesses should not be opened until they have pointed. Once opened they should be syringed out at intervals for a day or two with warm water containing 5 per cent. common salt.

If breathing is very difficult, a mixture containing 1 teaspoonful of potassium chlorate in half a cup of treacle may be smeared on the tongue twice a day, or else an inhalation may be given by pouring boiling water on a teaspoonful of Friar's Balsam in a bucket placed in the bottom of a chaff sack, and then placing the horses muzzle in the open end of the sack.

The horse should be placed in a shady yard with feed and water available. Because of his difficulty in swallowing, the horse's appetite should be tempted with freen feed and bran mashes. If there is any tendency to constipation, 6 oz. of epsom salts may be given in the drinking water. Rugging is helpful, except in hot weather. The eyes and nostrils should be swabbed out twice a day with cotton wool and 4 per cent. boric acid.

Prevention.

If there is any reason to suspect strangles, horses should be isolated at the first sign of symptoms. If practicable, their attendant should have nothing to do with other horses. All contaminated food, utensils, and grooming gear should be destroyed or disinfected, either by boiling or treatment with strong disinfectant. If the horse has been stabled, the stable will require thorough disinfection.

Red Worm Disease of Horses.

G. R. MOULE, Veterinary Officer.

EXTENSIVE surveys made recently in many parts of Central-Western Queensland have revealed that red worm disease of horses is very common and may cause serious loss, both from deaths and disability.

Description.

Worms known scientifically as the *strongylus* species are popularly known as "red worms," because of their blood-sucking habits, and, in consequence, their usual redness of colour. There are actually a great number of different varieties of these worms, and they are to be found in the large intestines and the blind gut of the horse. The worms are round in shape, and vary from about ½ to 2 inches in length. The larger worms are often thicker than a wax match, while the smaller ones are as thin as a thread, and are often hard to see.

Life Cycle.

The female worms in the intestine lay their eggs, which are passed out with the manure. The eggs hatch out into very small immature worms, which soon develop a strong protective sheath around themselves which protects them against dry weather. Once this sheath has developed, immature worms have the power to withstand hot dry conditions for almost three months.

The immature worms are picked up by the horse as its graze, and when in the body of the animal some of them commence wandering through the organs. Immature worms have been found in the liver, lungs, kidneys, lymph glands and blood vessels supplying the gut. After their period of wandering, the larval worms (as they are called) return to the large intestines and soon grow into adult worms, which suck the blood of their host.

Damage Done by Red Worms.

The immature worms can do much damage in the course of their wandering through the internal organs of their host, and very often cases have been found, on post mortem, in which the damage done to the lymph glands and the blood vessels supplying the gut is beyond repair. Severe colic, which usually proves fatal, develops when the blood vessels are damaged to such an extent that blood cannot get to the intestines. Some of the larval worms gain entrance to the gut wall, leading to the formation of nodules, which may seriously affect the movements of the intestines.

The adult worms have the power of sucking blood (hence their red colour), and some varieties actually eat the lining off the intestinal wall, leading to the formation of ulcers.

Symptoms.

The symptoms affected animals show are:—

(i.) Animals become easily tired and do not stand up to a good day's work.

(ii.) The coat becomes rough and harsh, despite abundant feed; and the lines running from the butt of the tail down the back of the hind legs become prominent.

(iii.) The horses lose condition, "tuck up" at the flank and begin to assume a haunted look, even though they are not working.

(iv.) In some cases, the membranes of the eyes and mouth become pale; and peculiar soft swellings develop on the legs, the brisket, abdomen, sheath, or head.

(v.) The manure may be soft and bad smelling, and later persistent diarrhœa may develop.

(vi.) Young horses heavily infested do not grow well.

(vii.) Untreated affected horses usually become listless and tend to pine away and die in from six to eighteen months.

Treatment and Prevention.

Taking the long view, treatment is of very little use unless it is combined with preventive measures.

The cause of the very heavy infestation of western horses with these worms is probably to be found in the practice on most properties of keeping a permanent horse paddock. The worm population in such a paddock becomes very high and re-infestation is continually occurring. Horse paddocks should, therefore, be rotated at three-monthly periods if practicable. Most of the immature worms will die out in about three months.

Horses should be treated at the time of each change of paddock—*i.e.*, just before they are drafted into a clean paddock. Probably the most suitable drug to use is phenothiazine, which is now obtainable from most of the chemists in Western Queensland. The dose rate is 1 oz. for the average-sized horse, but this should be cut down to ¾ oz. for smaller animals and may be put up to 1½ oz. for draught horses. The dose of 1½ oz. should, however, never be exceeded. The drug may be combined to advantage with 1 drachm of Istin and can be given as a drench, in gelatine capsules as a ball, or in a bran mash. This drug often makes treated animals a bit "muddy" around the membranes and the urine becomes red, but this should not cause great concern as these effects soon pass off after a short spell.

On a horse-breeding property, it should be a routine practice to treat all brood mares about one month before foaling commences; they should then be moved into a clean paddock in order to give the foals a reasonable chance to escape infestation during their early life.

SCRUB TICK IN CATTLE.

Cases of mortality in fully-grown cattle caused by the scrub tick have occurred in recent years in Queensland. The female scrub tick can be distinguished by its yellow legs from the dog tick, which has brown legs. It is found throughout the coastal belt and in the south as far west as the Bunya Mountains.

The first symptoms are paralysis of the hindquarters. This condition spreads gradually forward until the respiratory centres are involved, resulting in death, which may occur soon after the animal goes down or within about two weeks later. Little has been recorded as to treatment, but in one case success was reported with affected sheep after injection of trypan blue (piro blue). For cattle, 2 oz. of a 2 per cent. solution should be given as a subcutaneous (under the skin) injection, observing the usual precautions as to sterilizing syringe and needle.

The Department of Agriculture and Stock would be interested to hear of any results, good or bad, obtained by this method.

—G.R.B.-M.

AGRICULTURAL :: CHEMISTRY ::

Grain Sorghums for Stock.

MONTGOMERY WHITE, Agricultural Chemist.

GRAIN sorghums are proving superior yielders to maize in regions of less certain rainfall, or where, for various reasons, the water table has become so altered as to render maize a risky crop.

The value of these grains as feed and the methods for using them are set out in brief, in the hope they may help farmers to avoid some of the troubles that have been recorded by correspondents.

In so far as their general feeding value is concerned the grain sorghums fall between wheat and maize and, consequently, in most feeding programmes they introduce no great difficulty. It is only under special sets of conditions—*e.g.*, restriction of routine crops and concentrates brought about by the war—that the deficiencies of the grain are brought into relief.

Pigs.

The low vitamin value of grain sorghums makes it essential to provide pigs with green feed.

It is a safe rule to grind seed for pigs of all ages. Slips which have had access to whole maize make better use of sorghum seed than those previously accustomed to all slop feeding or milled foods. A sudden change to grain sorghum results in appreciable waste—the grain appears undigested in the faeces.

Where grinding is impossible or impracticable, soaking may be done. Soaking is probably cleaner and less laborious than boiling or steaming to jelly consistency.

Arrange for half-bags of the grain, tied with stout cord, to be suspended from a ridgepole arrangement, in water. An old bath tub is just the thing. By having short chains or S hooks hanging from the ridgepole the soaking is done without swelling of the tie cord, and the sack is easily lifted up higher for draining. Arrange to have one feed soaking and one draining. When the drained lot is taken away, raise the soaking lot and put in a fresh feed to soak. In this way, a routine is developed on a night and morning basis. Drain out any liquid left every few days, otherwise it develops an unpleasant odour.

A point to be remembered is that the protein of sorghum is incomplete, biologically, in that it is lacking some of the protein-building bricks so necessary for growing stock or high-producing, grown-up stock. These missing links should be obtained from other sources. The

best are first-grade protein concentrates—*i.e.*, milk, meatmeal, or bloodmeal. Seedcake preparations—*e.g.*, cottonseed, linseed, or peanut—are also good sources.

Hence the importance of feeding pigs good quality protein should be stressed.

Poultry.

One-third of the poultry ration may be grain sorghum, but in all cases where grain sorghums is used extensively, the birds should also get foods rich in vitamin A. Green feed or choice lucerne is best. It is very advisable to include maize in the ration when sorghum represents more than 20 per cent. of the total food.

All poultry foods should contain some protein of animal origin, but this is particularly important when grain sorghum, either as grain or meal, is used extensively. Milk is most valuable. Meat, liver, and bloodmeals are excellent.

Frequently, birds show a disinclination to take the grain when switched quickly from maize to wheat. The golden rule in all livestock feeding is to make any change gradually. If this is done, no difficulty is experienced.

Soaking of grain sorghums for poultry is not advisable.

Horses.

All sorghum seeds should be crushed when fed to horses. Hard-working horses receiving practically all their concentrates in the form of sorghum meals tend to become constipated, and at least 1 lb. of bran daily should be fed.

Dairy Cattle.

To obtain best results from dairy cattle, grain sorghum should be fed in meal form. In the absence of prepared concentrates rich in protein, it is an unfailing rule that grain sorghum feeding means legume feeding. Comparable results are obtained on the best stands of pasture.

Beef Cattle.

Ground or crushed grain sorghum is equal to corn in preparing beef cattle either for show purposes or for market.

Sheep.

Provided sheep are able to get sufficient "fill" to ensure contented rumination, there is no need to treat grain sorghum in any way. Only the very hard grains need grinding, and that only when the roughage is poor.

Under drought conditions, when animals may not be able to obtain sufficient roughage to ensure "cudding," the grain should be ground.

CHANGES OF ADDRESS.

Subscribers are asked to kindly notify changes of address to this Department without delay.

Rural Topics

Wild Life Preservation.

Queensland has done well, and may yet do better, in the reservation of Crown lands for national parks and sanctuaries for wild animal and bird life. The objects of Crown land reservation are various, and cover public recreation, forestry projects, and the preservation of wild life which has a direct bearing on the economy of the State. Bird life, for instance, is of vast economic value in its relation to the control of vegetable and animal pests.

The growing appreciation of the value of birds to the farmer is a very welcome sign—showing, for one thing, that the teachers in our schools, especially our country schools, are doing a fine job in instilling into the minds of our youngsters that birds, by keeping down insect pests, are among the farmer's best friends.

As to national parks—such as the Lamington Plateau and the Bunya Mountains—everyone is surely in agreement as to the importance of preserving or reserving typical forest and jungle lands, mountain country, and stretches of sea coast which have some peculiar interest because of their scenic beauty, their geological structure, their association with human history, their plant and animal life, and, above all, their suitability for recreation and rest.

As to our wild life—our native birds and animals—any national policy of protection is obviously a very wise one. And national park policy may be reasonably based on three broad principles. The first principle is that the preservation or protection of our wild animals and birds is inseparably linked with problems of soil, water, and forests. The second is that our native wild life must have an environment suited to its needs if it is to survive. And the third is that any use—that is, any economic use such as the taking of fur-bearing animals for their pelts (excepting, of course, rabbits, hares, foxes, or any other introduced animals that have become pests to pastoralists and farmers)—should be limited to the destruction of not more than the annual natural increase, if the breeding stock is to be kept up. Another good thing would be to make sure that those animals and plants which are more than ordinarily successful in the competition for life because of greater hardiness or fecundity than the less robust species, should be kept ruthlessly within bounds. The successful sanctuary, as any honorary ranger will say, is not necessarily a place where *all* plants and animals are protected; for, obviously, indiscriminate protection may soon lead to the survival of the species of plants and animals which need no protection at all, and to the consequent disappearance of the very forms of wild life for which the sanctuary was proclaimed.

As with our land and our soil, so with our useful and harmless wild life, it is necessary to acknowledge and appreciate our trusteeship for future generations of Australians.

Some Protected Birds.

Included among Australian native birds which are protected throughout the year in Queensland are:—

Apostle Bird, Australian Ground Thrush, Babbler (all species), Bar-Shouldered Dove, Bell Bird, Black Cockatoo (all species), Black Swan, Blue Mountain Parrot, Boatswain or Tropic Bird, Brolga or Native Companion, Burdekin Duck, Bustard or Plain Turkey, Cassowary, Cat Bird (all species), Cloncurry Parrot, Coachwhip Bird, Cuckoo (all species), Curlew (all species), Darter or Snake Bird, Doves (all species), Dollar Bird or Roller, Finches, Fly Catcher, Fly Eater, Frogmouth, Goose (all native species), Greenie or Scaly-Breasted Lorikeet, Ground Lark (all species), Ground Parrot, Heron.

Ibis (all species), Kingfisher (all species), Kookaburra or Laughing Jackass, Lark (all species), Lyre Bird (all species), Martin (all species), Miner or Soldier Bird (all species), Mopoke (all species), Torres Strait Pigeon, and all other native Pigeon species (including Wonga and Wompoo), Regent Bird, Rifle Bird, Satin Bird (all species), Swallow (all species), Warbler (all species), Wattle Bird, and Wren (all species).

Some Protected Animals.

Animals for which a close season throughout the year has been proclaimed, include:—

Cuscus or Spotted Opossum, Flying Squirrel, Nail-Tail Wallaby, Native Bear (Koala), Opossum, Opossum Mouse, Platypus, Porcupine (Echidna), Rock Wallaby, Tree Kangaroo, and Wombat.

General Notes

Fertilizer Rationing in Sugar Areas.

All available transport has been utilised in moving supplies of blood-bone and superphosphate to the sugar districts. This will result in areas extending from Mackay southwards receiving their full ration by the end of July.

North of Mackay arrangements for deliveries are not, however, so complete.

It is intended that districts which have received a full ration of blood-bone and superphosphate shall be issued with an additional ration for the period ending 31st January, 1944. This will be done as soon as practicable. The present rations will be continued for all districts in which the full ration has not yet been satisfied. Present stipulations regarding delivery still hold.

All available transport facilities will be used to move fertilizers to every district, but those areas which have received the lowest amount will receive first priority of any facilities offering.

If any other districts receive their full ration before 31st January, 1944, and there is a reasonable chance of moving additional fertilizer forward—providing it does not detract from any other districts' claim—a further ration will be issued in advance.

Difficulty is experienced in transporting to each district enough fertilizer to satisfy all growers' rations, and every endeavour is made to prevent, as far as possible, one district being over-supplied at the expense of another. With this in view, a dead-line date is fixed for placement of orders. This gives an opportunity to arrange supplies, so as to avoid any excess fertilizer being transported to any area.

Priority of delivery should be in sequence of lodgment of orders with each dealer on or before the closing date for receipt of orders.

Any grower who does not take delivery when the fertilizer is made available to him misses his turn, and his name will be placed automatically at the bottom of the list, the fertilizer being delivered to those next in order of priority who can take it.

When the date of delivery is nominated by the grower, dealers shall not hold such supplies in store pending that date to the exclusion of other growers.

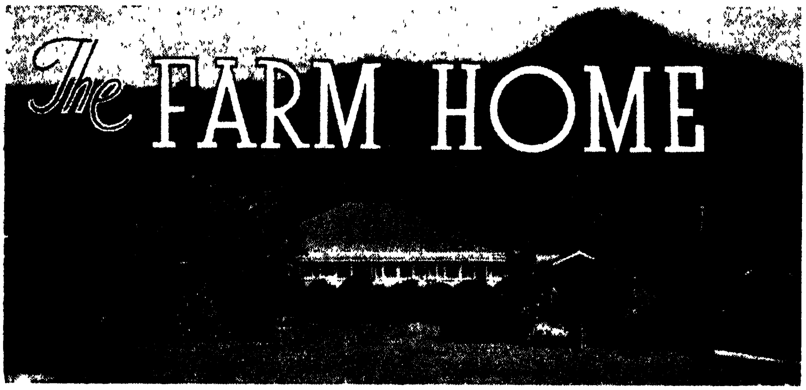
It should be realised that rationing of fertilizer is an endeavour to give each farmer a fair share of the available material, and no one should obtain fertilizer in excess of his ration, otherwise others will have to go short. Unclaimed rations do not belong to any district; they should be equally distributed to all who can use them.

All authorities to purchase fertilizer issued during 1942 under the Agricultural Requirements Control and Conservation Act, should be returned to the Department of Agriculture and Stock without delay, as they have now become ineffective.

Dealer's Purchase Docket—Second-hand Fruit Cases Act.

Regulations under "*The Second-hand Fruit Cases Act of* 1940" have been amended to make provision for the keeping of purchase dockets by dealers in second-hand fruit cases.

The Regulations at present provide for a return of dealers' purchases only, and it is considered that a docket issued at the time of purchase, bearing the signature of both dealer and vendor, and putting the onus on the retailer to receive a purchase docket for cases sold will do much to help in the administration of the Act and the conservation of fruit cases.



Maternal and Child Welfare.

Under this heading is issued each month an article, supplied by the Department of Health and Home Affairs Maternal and Child Welfare Service, dealing with the welfare and care of mother and child.

BABY'S HEALTH: NATION'S WEALTH.

The Magic of Toys.

(1.)

TOYS are older than civilisation itself and to the child they are more than mere playthings. They are the implements by which he educates himself and also his instruments for self-expression. The play life of the child is, indeed, one of the most interesting phases in the study of the human race, and mothers and fathers should learn as much as they can about it.

Since toys are of such importance in the child's mental and physical growth, it may be a good plan to think first of some definite rules relating to their use for the benefit of the givers of toys as well as the receivers.

To be really useful, a toy should fulfil two mains requirements—it must be both entertaining and educational. To be entertaining, it must hold the child's interest. Anything that stimulates his curiosity will also engage his interest, and any object which will give the child an opportunity to exercise skill will add to its value as an educational medium.

The following points apply to all toys without regard to cost or usefulness:—

1. Since most young children place accessible objects in their mouths, safety must be considered. Generally, the younger the child the larger should be the toy. It is really surprising what children are capable of swallowing, and doctors might furnish a small toy shop with the objects recovered from the stomachs and lungs of young children;
2. In addition to size, there is shape. This is particularly important in the case of very young children. Toys with rough and sharp edges should be avoided;

3. Then there is cleanliness. Things that are in frequent use collect dirt. Many of the playthings now sold are washable. It is a good plan to teach a youngster about cleanliness at an early age, and the washing of his own toys would be good training;
4. A gift once given to a child should be considered his property and he should have full responsibility for it. This is a most important point. Unless he shows marked tendencies towards destructiveness, the treatment of his toys should be determined by himself. Parents must remember that experience cannot be taught, it must be learned; and if a small child spoils or breaks his toys by his own actions he will learn to take more care of them another time. But do not forget that curiosity is one of the urgent drives of childhood and the small boy who takes his engine to pieces is not necessarily destructive. He merely wants to see what makes the wheels go round.

The age at which children appreciate certain toys is important. From birth to three months of age, baby shows no interest in anything but his own bodily needs. From three to eighteen months, baby uses only three senses—sight, hearing, and feeling; and so bright objects, rattles, and soft rubber animals and balls appeal to these senses.

Play between the ages of eighteen months and four years is concerned with movement, and toys for these years should include swings, carts, wheelbarrows and prams, or similar objects. At two years, the herd instinct gradually develops and it is most important that playmates should be provided for children from this age onwards. The society of adults is not enough.

At the age of three, the imitative and imaginative traits begin to unfold, and the little girl is able to appreciate dolls and her brother to show an interest in toy soldiers and similar objects. Remember, however, that children use toys as an outlet for their energy. Any article designed for movement is a welcome gift up to ten years and over.

Children of four and five years enjoy having fairy stories read to them or will thrill over the adventures of imaginary heroes. Books, therefore, should have a definite place in the life of every child.

The power of concentration is an urgent necessity in the life of every individual, but it cannot be developed by force or by mere instruction. An interesting toy will help to make a child concentrate better than anything else. The proper use of well-chosen toys will be of great benefit to the mental, physical, and social development of the child, although consciously he will be employing them as instruments of play.

Next month we shall consider the present shortage of play materials and what parents can do to overcome it so that their little ones may not be deprived of the magic that toys bring.

Questions on this and any other subject concerning Maternal and Child Welfare will be answered by communicating personally with the Maternal and Child Welfare Information Bureau, 184 St. Paul's Terrace, Brisbane, or by addressing letters "Baby Clinic, Brisbane." These letters need not be stamped.

MARKETING

The Pigmeat Acquisition Plan.

J. W. GARSDEN, Marketing Branch.

WITH the introduction early in June of the Pigmeat Acquisition Plan, providing for the acquisition by the Commonwealth Government of pig carcasses weighing over 100 lb. chilled weight "on hooks," the scheme for the stabilisation of the pig industry has now been launched. Its objective is twofold—(1) stimulation of production by assuring a reasonable return to the producer; and (2) planned distribution of available supplies so that requirements for the services, the civilian population, and for export may be kept in proper balance.

When announcing the Plan, the Federal authorities made known that, subject only to necessity arising from uncontrollable war conditions, it would operate for two years, and that guaranteed prices would be paid for acquired pigmeats during that period. These prices were decided on in collaboration with the Commonwealth Prices Commission; and the plan has been designed to give stability to the industry and increase production of urgently required baconer pigs. Supplementary action to be taken by the Prices Commission will provide for a higher return to the producer for quality baconers than for porkers.

The producer has been guaranteed price stability for a period of two years. A production goal has been set much in excess of the production levels attained in previous years. It is believed that the call will not go unanswered.

There are, however, one or two points it would be well for pig raisers and intending pig raisers to keep in mind, as will be apparent from the following brief summary of that part of the acquisition plan which is of most interest to producers.

The plan operates as from Monday, 14th June, 1943. Carcasses to be acquired in Queensland are those within the prescribed weight ranges treated at the licensed works listed below and passed by Commonwealth meat inspectors for local trade or export:—

Queensland Meat Industry Board	Cannon Hill Abattoir
Thos. Borthwick and Sons (Australasia) Ltd.	Moreton Works
J. C. Hutton Pty. Ltd.	Zillmere Works
Queensland Co-operative Bacon Association Ltd.	Murarrie Works
Darling Downs Co-operative Bacon Association Ltd.	Doboy Works
Darling Downs Co-operative Bacon Association Ltd.	Willowburn Works
Reeds Pty. Ltd.	Maryborough Works
Swift Australian Co. Pty. Ltd.	Gladstone Works

Central Queensland Meat Export Co. Ltd.	Lakes Creek Works
Conaghan Bros.	Rockhampton Works
North Queensland Co-operative Bacon Association Ltd. ..	Mareeba Works

Payment for acquired carcasses is to be on the basis of actual cold dressed weight and according to grade or quality.

The plan covers only pigs dressing out at 100 lb. or more. Within the range 100 to 180 lb., the payments to producers should be, *at export port,* first quality 8d. per lb., second quality 7½d., and third quality 6½d., with 6d. for pigs excessively overfat. The price for choppers, all weights, should be 5d. per lb.

The listed prices at which carcasses are to be acquired represent the prices at the usual export port, and include fixed margins to cover slaughtering and handling costs. The prices payable to producers should, therefore, be the listed figures less these margins and, if treated at country works, less the cost of forwarding live pigs from the country works to the usual export port.

Points which the pig raiser will be quick to observe are that under this plan the first quality baconer pig will attract a premium price; that for best results pigs should be marketed in prime, not fat, condition; that carrying pigs on to an overweight stage will be even more uneconomic than previously—irrespective of whether it is a case of carrying the porker type up to baconer weights or baconers until overfat—and that payment on a grade and weight basis will mean full payment for every pig delivered.

CONTROL OF FARM MACHINERY.

Many farmers may not have noticed that the dual control of the distribution of agricultural machinery, now exercised by the Commonwealth Government through Machinery Control Officers in the State Departments of Agriculture, also provides for control of the sale of second-hand tractors.

While the control allows of the purchase of many items on the certificate of local agents of machinery firms that the machinery is essential, certain items may only be purchased with the permission of the Machinery Control Officer, Department of Agriculture and Stock. Application forms, obtainable from District War Agricultural Committees and machinery firms, should be completed in either case.

Items subject to permit control include engines and machinery of which engines form a part, tractors, both new and second-hand, rotary hoes, separators, irrigation plants, windmills, and shearing machinery.

The object of the control is to ensure that the limited supplies of machinery available shall be distributed to the producers most in need of them.

THE COUNTRYMAN'S SESSION

Sunday Morning Radio Service to Farmers

(By arrangement with the Australian Broadcasting Commission)

Farmers are recommended to tune in to either a Queensland National or Regional Station.

EVERY SUNDAY AT 8.45 a.m.

GADGETS AND WRINKLES

HOW TO MAKE A COOLGARDIE SAFE.

THE Coolgardie safe is on much the same principle as the ordinary canvas water bag, and is cheaply constructed. It would be a good plan to have two safes—one for milk, cream, and butter, and one for meat and other perishables. In making the safe, the requirements are: timber for 3 in. x 1 in. uprights and rails and 2 in. x 1 in. braces. Each side consists of two uprights 4 ft. 6 in. long, two rails 3 ft. long, and one brace 3 ft. long. The brace for framework of front, in which the door is hung, will be only 18 in. long and will act as a stop to the door. The uprights and rails are framed together, as shown in drawing No. 1; the joints are halved together and screwed with two screws to each joint, and the brace is firmly screwed on the back. The four sides having been made are placed together, forming a square 3 ft. x 3 ft. 2 in., as shown in drawing No. 2. The sides are nailed together at the corners, and each corner is stiffened at the top and bottom by a brace 1 ft. 6 in. long let flush into top of rails and nailed thereto with 2-in. nails.

The floor is formed with 6 in. x ¾ in. tongued and grooved boards nailed on top of rails with 2-in. nails. The top should be made, as shown in drawing No. 3, of 6 in. x ¾ in. wood. The sloping sides are supported on eight triangular pieces 1½ in. thick, well nailed on top of rails and stiffeners. To save the labour of carefully mitreing the angles so as to keep water out, cover the joints with a strip of galvanised iron.

The door should be made the same way as the sides, but with two short braces, as shown in drawing No. 3, to be hung on a pair of 12-in. T hinges, and fitted with turn-bottom or other fastener. To catch the drip when the door is opened, a small gutter, made of light galvanised iron, should be hung on galvanised iron staples to inside of top rail of front. It should be so hung that when the door is opened the gutter will swing forward far enough to catch any drips. In closing the door should push the gutter back. A small gutter made of galvanised iron should be fixed with galvanised iron clouts to outside of bottom rails, with a fall to the corner most convenient for running water off. The basin on top may be any watertight vessel into which strands of wool are placed to syphon the water out on to the hessian. The drawings for the sake of clearness show the framework without any covering. All the framework is to be covered externally with hessian fixed with copper tacks to rails and uprights. The hessian should be washed before being used to rid it of the smell of the dressing.

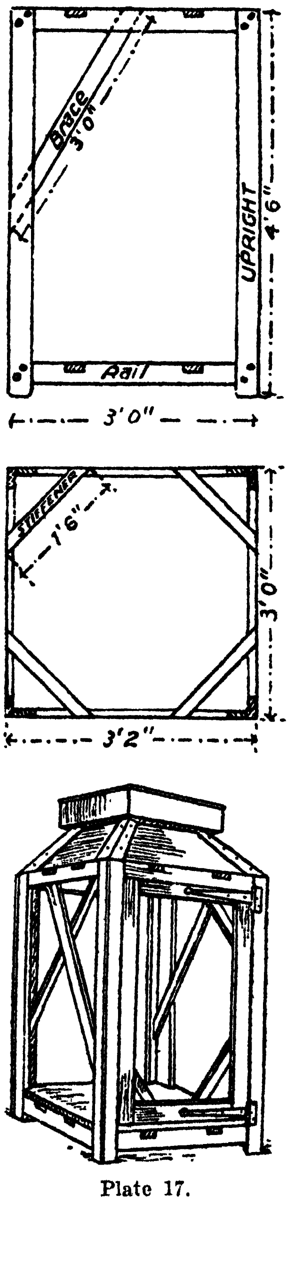


Plate 17.

PRODUCTION RECORDING.

List of cows and heifers tested officially by officers of the Department of Agriculture and Stock and which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Ayrshire Cattle Society, production records for which were compiled during the month of May, 1943 (273 days unless otherwise stated).

Name.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COW (STANDARD, 350 LB.).			
Trevor Hill Picture	W. Henschell, Yarranlea	18,181 25	682 018	North Glen Emblem
	SENIOR, 4 YEARS (STANDARD, 330 LB.).			
Alfa Vale Pansy	W. H. Thompson, Nanango	16,870·7	723·584	Reward of Fairfield
	SENIOR, 3 YEARS (STANDARD, 250 LB.).			
Braemar Bluebag	W. Henschell, Yarranlea	9,876·1	352 186	Blacklands Gay Lad
Yarranvale Primrose	W. Henschell, Yarranlea	9,268·93	324·427	Trevor Hill Bosca
	SENIOR, 2 YEARS (STANDARD, 250 LB.).			
Trevor Hill Patty 2nd	W. Henschell, Yarranlea	9,336·49	341·703	Sunnyview Royal
Fairvale Ethel 5th	J. H. Anderson, Southbrook	8,574·27	330 963	Corunna Supreme
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
Yarranvale Edna	W. Henschell, Yarranvale	9,415·27	365·114	Trevor Hill Bosca
Arolla Gentle 4th	J. Crookey, Allora, Yarranlea	8,129 89	341·879	Parkview Limerick
Glen Idol Countess	P. Doherty, Gympie	6,988·85	281 026	Blacklands Count
Glen Idol Daphne 6th	P. Doherty, Gympie	6,161 15	258·238	Blacklands Count
	JERSEY.			
	SENIOR, 2 YEARS (STANDARD, 250 LB.).			
Carnation Hopeful 4th	D. R. Hutton, Cunningham	5,479·23	336 143	Oxford Noble Peer
Carnation Peers Lass	D. R. Hutton, Cunningham	5,203·1	281·166	Oxford Noble Peer
Glenside Ponsie	J. E. Smith, Mudgeeraba	4,728·75	273·757	Oxford Brown Victory
Glenview Royal Majesty	F. P. Fowler and Sons, Coalstoun Lakes	4,640·77	253·983	Trinity Exchange
	JUNIOR, 2 YEARS (STANDARD, 230 LB.)			
Navua Dreaming Fernleaf	F. Eager, Petrie	4,754·7	292 913	Dreamers Hamptonne Star
Oxford Pretty Maid	J. E Smith, Mudgeeraba	4,596·1	257·288	Oxford Maids Victor
Ashview Locket	C. Huey, Sabine	4,765 6	249·505	Trecarne Butter Queen's Officer
	AYRSHIRE.			
	SENIOR, 2 YEARS (STANDARD, 250 LB.).			
Leafmore Nina	J. P. Ruhle, Motley	6,919·9	263 169	Myola Jellico
Benbecula Marina	R. M. Anderson, Southbrook	7,631·78	262·605	Benbecula Bonnie Willie 2nd
Myola Jollity 6th (Junior 2)	R. M. Anderson, Southbrook	6,515·67	256·283	Myola Bosca

A. H. TUCKER, Government Printer, Brisbane.

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Associate Editor
C. W. WINDERS, B.Sc.Agr.

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GOVERNMENT PRINTER, BRISBANE

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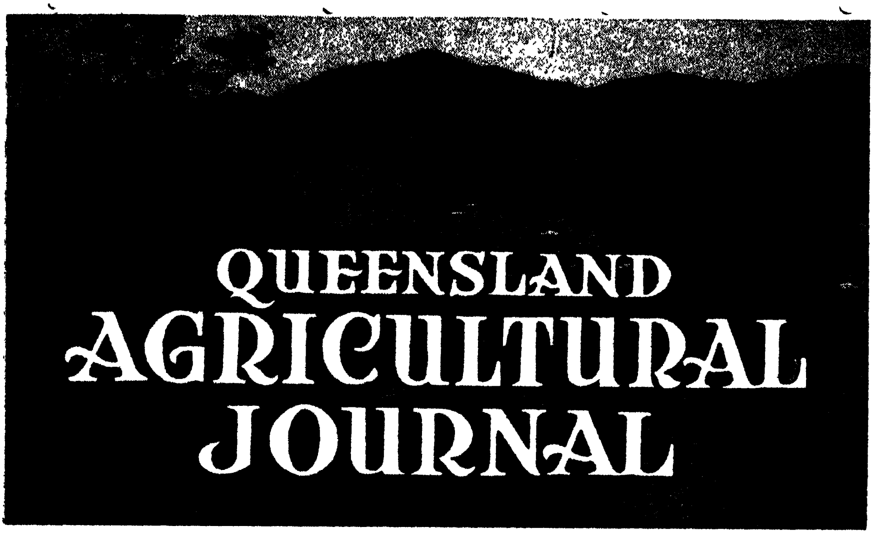
ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling**, members of Agricultural Societies, **Five Shillings**, including postage. General Public, **Ten Shillings**, including postage.



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Event and Comment

Post-War Reconstruction.

COMPREHENSIVE in scope and practical in suggestion, the evidence submitted to the Commonwealth Rural Reconstruction Commission in the course of the period of its visit to Queensland last month may be taken as representative of informed opinion in this State on post-war agricultural problems. One of the biggest national problems will be to "find gainful and useful employment for a vast number of demobilised servicemen and workers in war industries until such time as each can be reabsorbed in a normal peacetime occupation." The quotation is from a report of the Queensland Branch of the Australian Institute of Agricultural Science on post-war rural reconstruction, which was submitted to the Commission for consideration. Coming from men actively associated with primary production, this report has an especial interest for Queensland farmers, and the following summary is presented accordingly:

Both temporary employment on agricultural development and conservation of the natural resources of the country, and the ultimate absorption of people in land industries have been considered. The view is taken that further land settlement is justified only when efficient use of the land is assured, and such an assurance depends on the suitability and fertility of soils, topography, accessibility, and a satisfactory market for the crops produced.

Stability of primary industries should be the ultimate aim of agricultural policy. Consequently, the development of those industries should be along the lines of increased efficiency in production rather than of expansion of the acreage cropped, with provision for orderly marketing and distribution. Accepting the view that the producer should be regarded as holding his land in trust for succeeding generations, agricultural policy should provide not only for the development of farming land, but for its right use and conservation.

Land Settlement.

THE opinion is expressed in the report that it would be wrong to encourage the settlement of large numbers of people on the land without some check on the indiscriminate production of crops for which there is no assured profitable market. It is submitted, too, that the soundness of most branches of agriculture depends largely on increasing the efficiency of production on existing farms. To avoid alternating gluts and shortages, systems of crop control are suggested. In the placing of ex-servicemen on the land, it is suggested that special attention should be given to the practical training of inexperienced prospective settlers; to the suitability of the land for particular crops or for particular branches of animal husbandry; to making available partially developed holdings to settlers; to soil and water conservation; to efficiency in farming practice, including liming, fertilizing and weed control; and to the standardisation of implement parts.

Among other submissions in the report is the statement that successful land settlement schemes depend not only on the choice of suitable locations for farms, but also on the suitability of the settlers themselves for a life on the land and their capacity for efficient farm management. Many of the failures of the past have been due to the attitude that farming is an occupation which can be engaged in by inexperienced men, or even by those who are unfit for any other sort of employment. While there is always scope for unskilled rural labour, successful farm management calls for aptitude and knowledge of the job. The unskilled and inexperienced man is likely to be forced off his holding, impoverished and disillusioned, before he has learnt his trade by hard experience; and the man who is temperamentally unsuited for farming may never become efficient. Apart from the human factor, it should not be forgotten that the soil is a national asset which can be frittered away by misuse.

Agricultural Training.

OF the men who desire to go on the land when their war service is over, there will be at least two groups for whom some form of farm training will be necessary. Of these groups, the first will include men with some experience, but who desire to change over to some other class of farming from that in which they have been previously engaged; the second class will include men who have had no experience, of whom many, having joined the Services at an early age, have had no opportunity of learning at all. A scheme by which training could be given up to a reasonable standard of efficiency, and which would provide sustenance during the period of training, is suggested. Such a scheme would provide for some form of farm apprenticeship, and it would have an advantage as a preliminary try-out as to suitability for farming and, of course, farm management. It would provide for apprenticeship to approved farmers, who have successfully applied modern methods in their industry, for, say, a year at least so that the whole seasonal cycle of farm operations could be observed and practised under experienced direction.

In its wide scope, the report under review covers many other points for consideration in planning a post-war policy for rural industry, including a practical recognition of the relationship between forestry and farming—especially in respect of the control of soil erosion, prevention of the silting-up of watercourses, the grazing of forest reserves, and so on.

Potato Culture.

C. J. McKEON, Director of Agriculture.

PART II.

Harvesting.

IN Queensland, harvesting of the spring crop is usually carried out as soon as it can safely be undertaken, one of the chief objectives being to get the potatoes on the market as early as possible, since good prices are usually obtainable at the commencement of the season. The hot weather, which normally prevails when the spring crop is due for harvesting, and the risk of damage by the potato tuber moth, which is then particularly prevalent, also makes it necessary to harvest the crop as expeditiously as possible. In their anxiety to get the potatoes on the market at the earliest possible date, however, growers frequently make the mistake of digging them before the skins are firm enough, with the result that they arrive on the market in a badly rubbed condition and consequently bring a reduced price. As the autumn crop ripens during the cooler months of the year the tubers may be left much longer in the ground after the crop has ripened than is the case with the spring crop, and, if desired, digging need not be carried out until the tops have completely dried out.

Harvesting is still very largely carried out with a digging fork. A plough is also sometimes used to turn the tubers out but, although this is a quicker methor than hand digging, the crop cannot be harvested as thoroughly when a plough is used. Different makes of mechanical diggers are employed to a limited extent and some of these do very good work in clean crops and on certain classes of soil but, so far, no machine is available which will perform satisfactorily under all conditions.

The tubers, after being dug, should not be left exposed for any length of time to the hot sun and they should be bagged and removed from the field as quickly as possible. Furthermore, the bagged tubers should on no account be covered with the tops while standing in the field, as this is one of the surest ways of introducing the pest to the bagged tubers.

Grading and Marketing.

When preparing tubers for market they should be carefully graded, because a nice, even-sized line of potatoes will almost invariably command a better price than an uneven sample. Care should be taken to reject any tubers which are damaged or show signs of potato tuber moth

infestation, and on no account should tubers with rubbed skins or with dirt adhering to them be included when bagging. The tubers should be packed firmly in the bags, but not too tightly, as such tight packing is likely to cause bruising, which will be followed by decay. Too loose packing is equally objectionable for the same reasons.

Grading of potatoes is now compulsory and no person may sell or offer for sale in Queensland any potatoes which do not comply with one or other of the following grade standards as prescribed under *"The Fruit and Vegetables Acts,* 1927 *to* 1939."

"No. 1 grade shall consist of sound potatoes which shall have similar varietal characteristics and a mature skin; they shall be reasonably free from second growth, decay, mechanical injury and greening from exposure, dirt, and other foreign matter, and from damage caused by disease, sunburn, or insects, and shall be not less than three ounces in weight."

"No. 2 grade shall consist of potatoes which comply with the standard of No. 1 grade except as to maturity of skin and weight. They may have either a mature or immature skin, and shall be not less than one and a-half ounces but less than three and a-half ounces in weight."

"Seed potato grade shall consist of sound potatoes which shall have similar varietal characteristics and a mature skin; they shall be reasonably free from second growth, decay, mechanical injury, dirt, and other foreign matter, and from damage caused by disease, sun scald, or insects, and shall be not less than one and a-quarter ounces in weight."

"Chat grade shall consist of potatoes grown in Queensland which comply with the standard of No. 1 grade except that they shall not have a mature skin and shall be less than two ounces in weight."

"New potato grade shall consist of potatoes which comply with the standard of No. 1 grade except that they shall not have a mature skin, and shall be not less than three and a-half ounces in weight."

"Potatoes shall be deemed to comply with the standard of a grade if at least ninety-five per centum by weight comply with that standard."

"Every bag or container shall be clearly and legibly stencilled with the name and address of the grower of the potatoes and the grade and the name of the variety thereof in letters and figures not less than one and one-half inches in length, and in the case of seed potatoes every bag or container shall also have the word 'SEED' clearly and legibly stencilled thereon."

Storing.

Much greater difficulty is experienced in storing potatoes from the spring crop than is the case with the autumn crop owing to the fact that they require to be stored during the warmer months of the year when the potato tuber moth is likely to cause serious loss. Should that pest be present, fumigation with carbon bisulphide is called for. Only sound, dry, unblemished potatoes should be stored, and these should be spread in successive shallow layers with a layer of dry grass between each layer. Light should be excluded, but at the same time the store room should be well ventilated.

Storing in pits (Plate 19) is also resorted to where large quantities of potatoes have to be stored, a naturally dry piece of gently sloping land being chosen as the site of the pit. The pit should be excavated lengthwise down the slope, it should be 1 foot in depth and 6 feet in width, and of sufficient length to accommodate the quantity of potatoes to be stored. If damage by rodents is anticipated, the pit should be

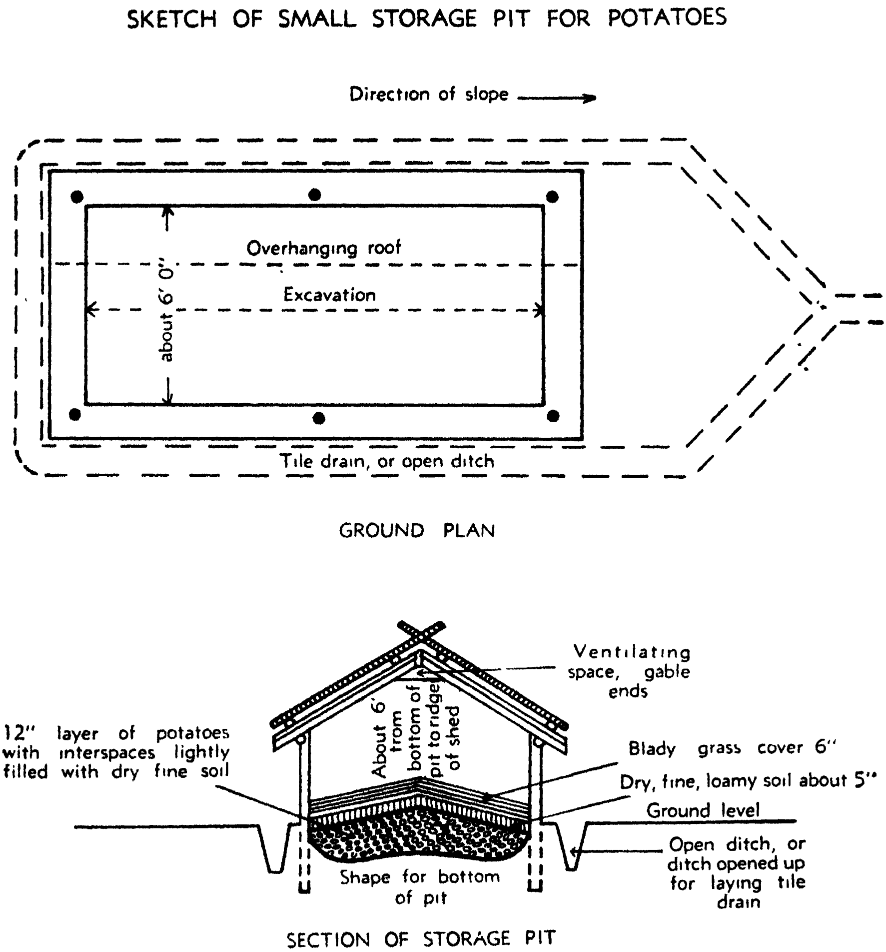


Plate 18.

SKETCH OF SMALL STORAGE PIT FOR POTATOES.

protected by a sunken galvanised iron barrier. Suitable open drains should be provided or agricultural drains should be laid, the bottoms of the drains being 8 inches below the level of the bottom of the pit, the latter being so sloped that any moisture will be drawn naturally into the drains. A low shelter shed with wide eaves sufficiently high to work under should be constructed of bush timber covered with bark, such as stringy bark, which is also used for covering the gable ends and sides. Ventilation should be provided at the gable ends and 6 inches of ventilation should also be provided near ground level along each side.

The potatoes must be handled carefully when filling the pit in order to prevent bruising and the operation should start at one end. A single layer of potatoes is placed in position and fine dry soil or fine dry peaty vegetable matter is scattered over them in quantity sufficient to lightly fill the spaces between the tubers. This procedure is repeated until a layer 1 foot in depth is obtained, the whole then being covered with 4 or 5 inches of dry soil or peaty vegetable matter, which, in its turn, is covered with 6 inches of blady grass or other somewhat similar suitable covering.

Potato culture is dealt with in more detail in the bulletin *Potato Growing in Queensland*, issued by the Department of Agriculture and Stock (1942).

The Sweet Potato.

J. A. KERR, Instructor in Agriculture.

THE sweet potato probably originated in South America, but it is now extensively cultivated throughout the tropics and sub-tropics. The enlarged roots are the edible portion of the plant, although the vines are frequently grazed by, or are cut and fed to, cattle and pigs. The roots of the many varieties differ considerably in length, shape, and the colour of the skin and flesh. Climatic and cultural conditions may also cause a slight variation in the shape of the roots.

The value of the sweet potato, particularly for the table use, is not appreciated to the extent that is warranted by the inherent merits of that vegetable. This is due, to a large extent, to the fact that poor-quality roots are frequently marketed, and until such time as only desirable roots of the best table varieties are available to consumers the popularity of the sweet potato is not likely to increase. A comparatively small to medium-sized mature root is required for the table market, but many of the roots sold for that purpose are immature or contain an excess of fibre and are of varieties which, producing as they do a preponderance of large roots, are unsuitable for table purposes. The large roots of these varieties are retained for farm consumption and include many of the fully developed and accordingly better quality sweet potatoes. The selection of varieties for table use must, therefore, be confined to those which produce a number of good quality, medium-sized roots; the larger varieties, of which only the comparatively small and often immature or otherwise inferior roots are of a size suitable for marketing, should not be drawn on to supply the table market.

The flesh of mature sweet potato roots varies according to the variety, it sometimes being of a rather dry, floury nature, while in other cases it is of a moist and slightly sweeter nature. Each of these types of root is produced by a number of recognised varieties, and if only well-selected, evenly graded roots of such of these as are table varieties were marketed for table use an increased demand would be created, particularly for the moderately moist type, such as is represented by Porto Rico.

Roots which are unsuitable for marketing are of considerable value for pig-feeding purposes, and may be fed in either a raw or boiled

state. The crop may also be grazed by pigs, but when this is done the usual ration of skim milk or concentrates should be continued. Pigs are also of value for cleaning up paddocks after the crop has been harvested.

Climatic Requirements.

The sweet potato requires a warm climate and a growing season of from three and a-half to five months. It does best in districts enjoying a moderate rainfall, for heavy and prolonged rains frequently encourage excessive vine growth and poor development of marketable roots.

Suitable Soils and Rotations.

Sweet potatoes can be produced on a wide range of soils, but sandy loams or similar open-textured soils are particularly suitable for the crop. Providing the soils selected are well drained, the presence of a moderately heavy subsoil is no disadvantage in growing sweet potatoes. Deep friable soils frequently produce long irregular roots, whereas the occurrence of a moderately heavy subsoil tends to produce a compact better-shaped root. Heavy fertile soils frequently produce an excessive vine growth and a reduced yield of roots. Moreover, on heavy stiff soils the roots are often badly shaped and are subject to growth cracks.

Sweet potatoes thrive best when an abundance of humus is present in the soil, and for that reason poor sandy soils are unsuitable unless they are carefully rotated with green manure crops Like most crops, sweet potatoes respond to a suitable rotation, the use of cowpeas as the crop proceeding the sweet potatoes being particularly valuable in the rotation.

Preparation of the Soil.

The preparation of the soil should be thorough. The first ploughing should be to a depth of 9 inches, but if the sweet potatoes are intended for the table market, subsequent ploughings should be shallower to allow a slight compacting of the lower layer of the soil, thus tending to produce better-shaped roots.

Varieties.

A considerable number of varieties have been introduced to Queensland, four of the best known of these being Porto Rico, White Yam, Director, and Pierson. These varieties are described in the following paragraphs.

The Porto Rico variety (Plate 19), at present probably the most favoured in market demand, has a leaf of variable shape, which is, however, mostly large and shouldered and is possessed of a very long leaf stalk; its veins are purple with a vivid purple spot at the base of the midrib. The purple stem is of medium length and diameter, and this variety generally produces an abundance of vine and leaf The root is usually of a swede turnip shape and is normally well bunched round the main stem; its skin is pink and its flesh yellow. This is a high-yielding variety which is generally earlier than the varieties remaining to be discussed.

The White Yam variety has a large, broad, round or slightly shouldered, dark-green leaf with green veins. Its thick, medium-length stem is also green with purple tinges. The globular root is of medium size and has a smooth, white skin and white flesh. The roots are fairly well clustered round the main stem.

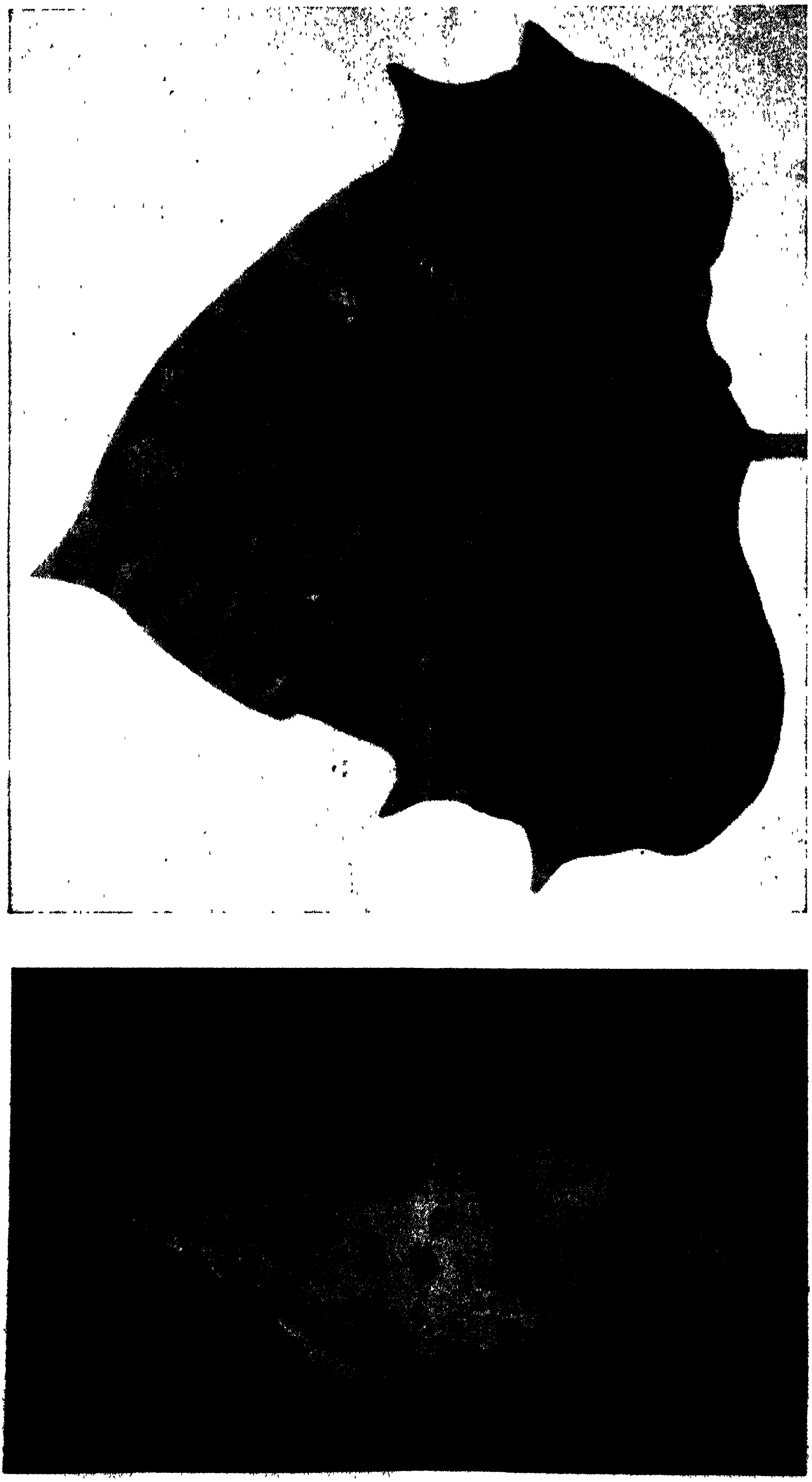


Plate 19.
PORTO RICO.

The leaf of the Director variety is large, broad, and shouldered, and has very long leaf stalks; the veins are tinged with purple and there is a purple spot at the base of the midrib. The pale-green stem is long and thick and there is a purple patch in the leaf axil. The large roots are rather thick and long and their skin and flesh is white.

The dark-green leaf of the Pierson variety is long, large, and round in shape and has green veins. Its long, thick stem is white in colour, but the older portions show a purple tinge. The large, pear-shaped root has a smooth white skin, with white flesh. The roots are fairly well bunched round the main stem.

Planting Material.

The sweet potato is propagated by means of slips or cuttings, and in order to maintain both yield and quality, regular selections of roots for slip or cutting production should be made each year in the field from suitable plants. The selection should be confined to plants producing satisfactory yields of smooth, well-shaped, marketable roots of a type characteristic of the variety to be propagated. The smaller roots from these plants should be reserved for propagation purposes and, after exposure to the sun for a few hours, they should be stored in dry sand, in which they will keep for several months.

The term "slip" refers to the shoots which develop on the sweet potato root when it is bedded in sand or left in the soil, the term being applied to the shoots when they are 6 to 8 inches long. The slip generally possesses a number of fine roots, which usually are in greater profusion when the slip is produced in a sand bed instead of in the field soil. If it is left on the parent root, the slip will develop into a large vine, which may be cut into suitable lengths or "cuttings" for planting purposes.

The use of slips may be necessary for propagation purposes in districts in which the growing season is short on account of prolonged winter conditions. In such districts, the selected roots should be placed in prepared, protected sand beds some weeks before the time when the final frosts normally occur. They should be covered by sand to a depth of several inches, each root being slightly separated from its neighbour. In particularly cold districts the use of bottom heat may be necessary, and this may be obtained by forming the sand beds over a depth of from 6 to 8 inches of fresh manure. Sufficient water should be applied to the beds to encourage the roots to develop the required slips, which can be removed from the parent root, for planting, when they are about 6 to 8 inches long. Two or three collections of such slips may be made from each bed. Two to three hundredweight of roots are required to produce sufficient slips to plant an acre from a single collection.

In most districts in Queensland, however, the general practice is to use cuttings for planting, and, providing these are planted under favourable weather conditions, they readily become established. For the production of cuttings, root selections should be made as for slip production, but the roots are then planted in rows in cultivated soil without the special preparation of beds required for slips. A sheltered site should be selected for cutting production and an application of farmyard manure is beneficial. Cuttings about 12 inches long should be made from the resultant vines, and these should be chosen from towards the growing ends of the vines, care being taken to avoid the

tough portions near their bases. These tough portions rarely produce plants and yield equal to those obtained from the other portions of the vines, the growing tips probably representing the ideal cuttings. When conditions are favourable, the vines make very rapid growth, and the number of roots required to produce planting material as cuttings is considerably less than the number required when slips are to be planted. From 50 to 100 roots produce sufficient cuttings to plant several acres.

In districts which are free from frost, the plants continue to grow from season to season, and the area on which they are growing eventually becomes a dense mass of vines. The satisfactory selection of planting material from the most desirable type of plants is an extremely difficult matter on such an area and selection therefrom is a practice that is likely to result in the deterioration of both quality and yield. Should it be impossible to obtain planting material elsewhere, then only the new season's growth should be used from such an area.

Planting.

Planting of the slips or cuttings may be carried out as soon as it is considered that frosts have ceased to occur, providing, of course, that weather conditions are otherwise suitable. Planting can be successfully continued until January. Later planting can be recommended only for localities which are free from frost or in which early frosts do not occur.

Cloudy or showery weather is ideal for planting and the soil should be in a moist condition when this operation is carried out. The slips or cuttings are planted in rows from 3 feet to 3 feet 6 inches apart and are spaced from 18 to 24 inches apart in the rows. Long cuttings should be avoided, the best length thereof, as already indicated, being 12 inches; only one joint of the cutting should be buried in the soil, and then to a depth of 4 to 5 inches.

Several methods are used for planting, the most popular and also the most reliable method being hand-planting by means of a spade or other tool suitable for opening the soil. The spade is driven into the soil to the desired depth and then pressed slightly forward to permit of the slip or cutting being placed in the cavity at the back of the spade. When the spade is withdrawn the soil should be pressed firmly around the slip or cutting, using either the hand or the foot for that purpose. The plants may also be ploughed in, and where this method of planting is adopted the field is reploughed and the slips or cuttings are placed in the furrow while the ploughing is in progress, only every third or fourth furrow, of course, being planted. Alternatively, on prepared soils, furrows are opened across the paddock at the required distance apart, and after placing the slips or cuttings in each furrow, a second furrow is ploughed alongside it so as to cover the planting material. Rolling with a suitable heavy roller of large circumference to compact the soil around the slips or cuttings is necessary when the planting material is ploughed in by either of the methods just described.

Planting on ridges approximately 6 inches high, which have been raised by means of the plough and flattened on top by the harrow, is a method which is frequently practised. The ridges provide a warm well-drained situation for the tubers and, in addition, the harvesting of the crop is simplified by the adoption of this system of planting.

On warm well-drained, sandy loams ridging is not as necessary as is the case on heavier types of soil, except in districts in which prolonged wet weather is likely to be experienced.

Cultivation of the Crop.

Row cultivation by scufflers should be carried out whenever necessary until the spread of the vines render further inter-row cultivation impracticable. On well-prepared land very little inter-row cultivation, however, should be necessary.

Various practices, such as nipping the tips of the vines, cutting off the vines at a distance of 2 to 3 feet from the base, and lifting the vines from the ground and rolling them back to prevent the formation of surface roots have been recommended. The result of such practices have been somewhat inconclusive, and there is some doubt as to whether any constant increase of yield may be expected from their adoption.

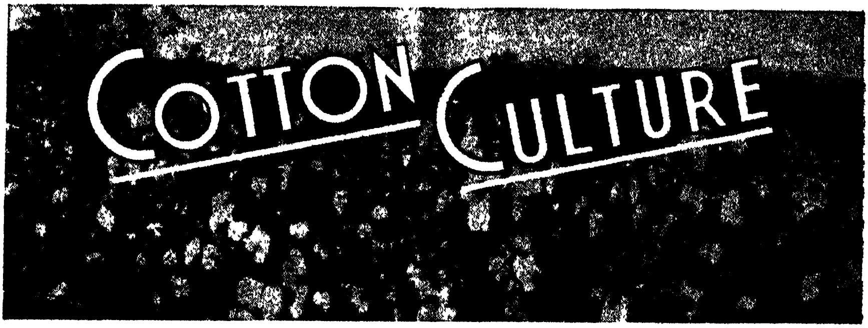
Harvesting.

Sweet potatoes are ready for digging when the sap on an open cut dries out a white colour rather than a greenish black. Care should be exercised when digging, because sweet potatoes bruise very easily, though a clean cut usually callouses over. The most satisfactory method of harvesting is by hand digging, using a hoefork or a digging fork. but occasionally on large areas the roots are ploughed out, a disc coulter being attached to an ordinary single-furrow mouldboard plough for that purpose. This method of harvesting is undesirable if the roots are intended for the table market, but is not objectionable in the case of roots required for stock feeding purposes, especially if they are to be consumed shortly after harvesting. No satisfactory mechanical digger has yet been evolved. The roots should be carefully graded and marketed in a clean, attractive condition.

A recent bulletin, "The Sweet Potato," contains illustrations of other varieties grown in Queensland. This bulletin is obtainable on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

CHAFFCUTTER POWER REQUIREMENTS.

Width of Mouth (in.)	Number of Knives on Flywheel	Approx. Quantity of ¼in. Chaff Cut (cwt. per hour)	Power Required (B.H.P.)
9	2	4	1½
11	3	12	4
13	3	20	6
15	5	40	8



Cotton Seed Planting Rates.

W. G. WELLS, Director of Cotton Culture and Senior Research Officer.

APPLICATIONS for cotton seed which have been received during recent years have indicated that there has been a general tendency for cotton growers in some districts to use a rather light planting rate when ordering their seed requirements. This has been due to their desire to reduce costs of production by planting at a rate that would provide a stand of seedlings which would either require only the thinning out of bunches of plants or which could be left unthinned.

Each season many reports are received, however, that an appreciable acreage of the first plantings has been replanted. In some instances the original stand of seedlings has been so thinly spaced that even light attacks by insects quickly reduced the number of seedlings below what would give a final satisfactory plant population. In other cases a rain occurring before the seedlings appeared has crusted the soil sufficiently to prevent the small number of seedlings from breaking through the surface. As the value of obtaining an early stand of healthy plants has been well demonstrated in all districts south of Proserpine, it is obvious that sufficient seed should be planted to ensure the early plantings being maintained.

Investigations conducted at the Biloela Research Station have indicated that when using a variety with seed of medium size the following rates of planting will allow of the planting machine dropping approximately the indicated average number of sound seed per foot of row:—

9 lb. per acre = 2·8 seeds.
10 lb. per acre = 3·1 seeds.
11 lb. per acre = 3·4 seeds.
12 lb. per acre = 3·7 seeds.
13 lb. per acre = 4·0 seeds.
14 lb. per acre = 4·3 seeds.
15 lb. per acre = 4·6 seeds.

In order to ascertain what stand of seedlings could be obtained with such a range of quantities of seed, planting rates of 9 lb., 12 lb., and 15 lb. of delinted seed per acre were used in soil in satisfactory condition for giving a good germination. Actual counts made over an acre of soil indicated that the following number of seedlings per foot of row were obtained:—

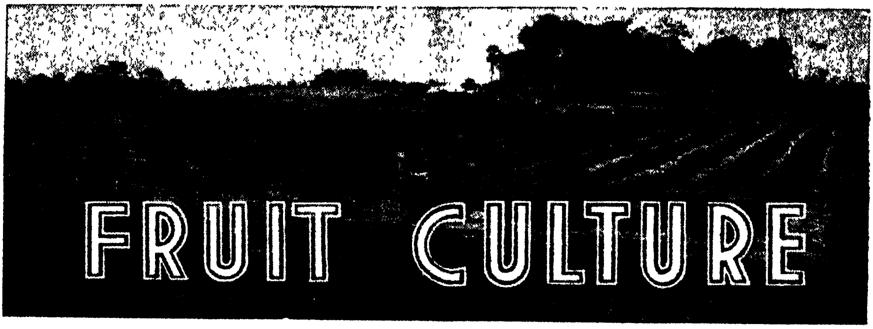
A rate of 9 lb. delinted seed equalled 2·05 plants per foot of row.
A rate of 12 lb. delinted seed equalled 3·46 plants per foot of row.
A rate of 15 lb. delinted seed equalled 4·18 plants per foot of row.

It is not recommended that a planting rate be used which will give a stand of fewer seedlings than three to four per foot of row. As the above stands were obtained under very satisfactory conditions for securing a good germination of the seed, it can thus be seen how necessary it is to plant at least 12 lb. delinted seed per acre when using a 4½ feet row spacing. A row spacing of 4 feet would at the same rate of planting per foot require 13·6 lb. delinted seed per acre to give 3·46 plants per foot of row under good conditions.

Growers planting sizeable acreages of cotton often maintain that they cannot afford to employ labour to thin out their crops to the spacings recommended for their soils. They accordingly use a planting rate which will just give a germination of seedlings that will result in a final stand of irregularly spaced plants which will require favourable climatic conditions to yield a profitable return. If severely dry weather is experienced when the plants of such spacings are well laden at mid-season, serious shedding of crop results. Conversely, if very wet conditions are experienced before the plants are well laden, serious shedding of the flower buds followed by rank growth of plant may occur, particularly in crops on fertile soils. Numerous experiments and the experience of many growers have demonstrated that it undoubtedly pays to thin the plants relatively uniformly to the spacings recommended. Growers should therefore plant at a rate which will allow of a good final stand of plants being obtained, even if it necessitates thinning out of the excess plants.

It is also advisable to plant at a rate which will give a sufficient stand of seedlings to allow of cross harrowing being practised. Growers who have tried cross harrowing when the seedlings were well established have found that only one cross harrowing in a season experiencing light rainfall during the seedling stage of the plants markedly reduced the amount of inter-row cultivation required to control weed and grass growth between the rows. In addition the cross harrowing destroyed all weed and grass growth in the rows of cotton, and also served to thin out the bunches of the cotton seedlings, thereby reducing to a minimum the amount of hoe labour required to clean and thin the crop. Where a thin stand of the seedlings had been obtained, however, the cross harrowing tended to destroy too many of them, thus necesitating all of the cultivating being done in the usual manner with either scufflers or riding cultivators. In addition, the employment of the normal amount of hoe labour was required, which is an important factor under present conditions of labour shortage.

It is recommended, therefore, that when ordering their seed requirements growers base their needs on a planting rate of at least 15 lb. delinted seed per acre for cultivated areas. This rate should normally ensure sufficient germination being obtained to give a stand of seedlings that can be cross harrowed and still leave enough plants to obtain a final proper stand. Where it is necessary to use, fuzzy seed, as when it is intended to plant a large acreage in the dry soil or where the planter requires the use of this type of seed, a planting rate of 20 lb. per acre should be the basis of ordering seed. For planting with the "walking stick" type of planter in the newly burned scrub areas, it is recommended that a rate of 10 lb. delinted seed per acre be used.



Citrus Pruning.

R. L. PREST, Instructor in Fruit Culture.

Oranges.

Young Trees.—The pruning of young trees should be confined to the removal of adventitious shoots from the stem and the checking of excessively vigorous growths from the main arms. Where possible, it is desirable to build up on three main arms. Two secondary arms may be permitted to grow from the ends of each of these main arms so as to develop a strong and well-shaped top. Other secondary arms will grow but should be removed. Undesirable shoots which grow all along the main arms, and which are obviously out of place, and would by their continued growth weaken the framework of the tree, should be cut away. In instances where awkwardly-shaped trees are received from the nursery, it is often possible to train a shoot, which ordinarily would be out of place, to develop and fill up a gap. Such training involves shortening back the required shoot at some dormant period of growth to a bud pointing in the direction it is desired the shoot should grow. Long, weak limbs that do not show a tendency to branch should be headed back generally to the limit of other growths, so that the tree will grow strong, compact, and symmetrical. The top should not be allowed to become too dense; on the other hand, it should not be kept so open as to permit the sun scalding the main limbs and branches.

Bearing Trees.—Provided that a well-developed framework has been maintained, young, well-grown trees should come into profitable bearing at an age of between four and six years. During the first years of bearing, pruning should be directed towards the removal of sucker growths from the main branches and weak fruiting shoots. Where pruning operations have been diligently carried out on young trees, they actually require very little pruning during the first fruiting years, except that they should be gone over occasionally and suckers removed. Sucker growths may, as a general rule, be considered parasitic, but they do not necessarily remain so, for in many instances they later produce bloom and fruit of normal fullness. This fact can be made use of when necessary in replacing broken and damaged limbs.

There is no doubt that the low production in the case of many older but well cared for orchards is due to the lack of vigorous healthy fruiting wood. This condition points to the necessity for a periodical renewal of fruiting wood, which can best be accomplished by thinning out and at the same time shortening back terminal growths and twigs. The cuts

should be made right back to strong new growths, removing weak shoots and those that have borne fruit. The thinning leaves room for the necessary subdivision, whilst the shortening back tends to force into growth dormant buds from behind, stops the excessive growth of any branches, and at the same time renews supplies of fruiting wood. Where crowding of growth becomes evident, the removal of an entire branch is at times desirable. The entry of plenty of light and air assists the growth of healthy and vigorous shoots behind the outer ring of foliage. These shoots make new fruiting wood, at the same time any excessive growth of suckers or water shoots which arise from well inside the tree following heavy pruning require to be cut away or they will absorb a lot of vigour and crowd the centre.

Old Trees.—In older trees, where growth has become stagnant, provision will require to be made for the removal of old, crowded, and dead limbs. In such instances, pruning is of a much heavier nature, requiring at times the removal of large branches. Such branches should be cut right back to their source of origin so that the sap is readily diverted to the remaining limbs, encouraging the growth of new wood. Under no circumstances, whatsoever, should stubbing be resorted to. In instances where it is necessary to replace a number of large limbs, it is preferable to do the work gradually over two or more years to avoid excessive suckering.

The lower branches of trees should not be allowed to touch the ground, as fruit borne on such branches is generally blemished and of poor quality. On the other hand, trees should not be pruned too high from the ground. The height to which they should be lifted varies according to circumstances, in most instances knee-high will prove to be satisfactory.

In Queensland, the regular thinning and pruning of bearing trees is definitely necessary and should be carried out during the winter months and, where possible, completed before spring growths occur—particularly where regular pruning has been neglected and heavy cutting is necessary. Frequent and regular treatment tends to preserve as nearly as possible the balance between the root system and aerial portions of the tree, assists in economical pest control and cultural requirements, and counteracts unequitable climatic conditions.

Mandarins.

The majority of mandarins when not systematically trained and pruned are often merely shrubs, not trees. They naturally grow very densely, and unless regularly thinned out and shortened back after the fruit has been harvested, the massed twigs become so dense that many perish and the remainder are so weakened that only small, inferior fruits are produced.

The treatment at planting is identical with that of the orange. After the first season from planting, numerous, vigorous, upright shoots arise from the head of the tree. While small, these should be thinned, leaving only those which will assist in building a desirable framework. These should be carefully watched, and where the growth becomes too lengthy they should be shortened back to the limits of other growths. Heading back and thinning may be done when growths have hardened, not when they are soft and growing rapidly. It is possible to check excessive growths by pinching out an inch or so of the tips.

The densely growing habit of the mandarin, particularly such varieties as the Beauty of Glen Retreat, Scarlet, Thorny, and similar types, leading to a profusion of weak shoots, is responsible for overbearing and resultant small and inferior fruits at an early age. Providing that a well-developed framework has been maintained, young, well-grown mandarin trees may be permitted to bear at four years of age. The annual pruning of bearing mandarin trees requires the same regular and close attention as in training and forming young trees. The dense growths and crowded branches require to be well thinned out and shortened back to vigorous laterals of current season growth, removing weak twigs and, where possible. shoots that have borne fruits. In the case of types similar to the Beauty of Glen Retreat, Thorny, and Scarlet, the thinning and shortening back may be described as heavy; modifications should be practised according to the habits of the tree growth of the various types of mandarins. Types such as Fewtrells Early and Ellendale Beauty resemble the orange tree in growth and should be treated accordingly.

The annual pruning, permitting ample light and the ready circulation of air throughout—

(1) Greatly increases the vigour of the tree;

(2) Removes surplus growths and twigs;

(3) Improves the size and quality of the fruit; and

(4) Provides for the renewal of ample, young, and vigorous fruiting wood.

Lemons.

With lemons the general practice with growers has been to prune severely while the trees are young in an effort to control the growth, and so produce a strong framework. In some instances, such treatment has retarded growth, and certainly it has retarded the early fruiting of the trees. Apart from the necessary trimming at planting, which, similarly to oranges, consists of shortening back and removing broken and bruised roots, and a corresponding shortening back of the head of the tree in such a manner as to produce a strong, straight stem with three or four well-placed arms radiating therefrom, little pruning should be done during the first two or three years. All that is necessary is a light thinning to remove any undesirable shoots that are out of place and would later upset the balance of the tree, and perhaps a shortening of excessively vigorous shoots. Main, upright-growing limbs, evenly spaced, should be selected as main leaders. As the tree grows older these limbs become weighed down at the ends by further branching and the weight of fruit; strong side shoots will develop from them. These side shoots should be thinned out, but not all removed. Those left, when hardened, should be shortened back to three or four buds to form spurs, which will produce the best fruit. Suitably placed growths may be left to grow and take the place of the first leaders which have been weighed down.

In time, it will be found the tree is built up of series of tiered branches radiating from the main framework. The object of building up the tree in this manner and spurring is to encourage a fruit-bearing habit. This is explained as follows:—As the fruit weighs the vertical branches down to a more horizontal position, the vigour of the branches is reduced and side shoots arising from such branches are, when spurred as outlined above, conducive to fruit production.

When shortening side shoots, the cuts should be made well back into ripe wood, thus throwing the sap into dormant buds. Light wood issuing from inside the more erect permanent arms may be retained, shortened for spurring, and from time to time renewed. No rank growth should be tolerated, unless it is required to continue the work of some displaced leader.

As the limbs drag down, it will be necessary from time to time to lift them by removing some of the lower limbs.

GARDEN SOIL.

The essential requirements for the successful production of vegetables has lately been frequently stressed through various channels, but it is well for farmers and home gardeners to bear them in mind. Much good effort might be wasted by a failure to appreciate the special conditions required for these crops.

A soil of good depth is the first essential. Absolute figures cannot be stated, but experience indicates that productivity declines significantly as the depth of top soil falls to a few inches. A top soil of at least 7 to 8 inches should be the aim. Where shallow surface soils are cultivated it is advisable to bed-up.

Of equal importance is a liberal supply of organic matter in a well rotted or decomposed state. The physical condition, or tilth, of a soil is largely dependent on the supply of humus or decomposed organic matter in it. For example, sandy soils are made more retentive and clayey soils more friable by the incorporation in them of organic matter. Of importance, too, is the supply of plant food elements made available in the soil by the organic matter in its decomposition. Green manures, farmyard manure, and compost are important supplies of organic matter.

The essential plant food elements—nitrogen, phosphoric acid, and potash—must be in a liberal supply for a vegetable soil to be fertile. On the farm they are usually added in the form of artificial fertilizers. The home gardener can supply or supplement his needs by the liberal use of decomposed manure or compost, and by waste materials of the household, such as kitchen refuse, bones, and wood ashes.

The reaction of a soil or, in other words, its state of acidity or of alkalinity is important. Unfortunately, the degree of acidity or of alkalinity can be determined only by some special means. Limestone or other lime-containing materials is used to correct acidity or "sourness" in soils. In the home garden the use of wood ashes in moderate amounts would help to ameliorate the adverse effects of "sourness."

Other essentials for the successful cultivation of vegetables are conditions of adequate sunshine, good drainage, and, if necessary, soil erosion control.

—W.J.C.

Vegetable Production

Growing Vegetables for Seed.

H. BARNES, Director of Fruit Culture.

THERE is still a serious shortage in some classes of vegetable seeds throughout Australia, in spite of efforts to provide for the needs of all. Each State has undertaken to produce as large quantities as possible of the kinds of seeds which can be grown, but individual growers can assist to overcome the shortage by producing their own requirements. Seeds which can be grown very well in Queensland include pumpkins, marrows, cucumbers, tomatoes, beans, lettuce, and carrots.

There is really nothing difficult about producing seeds. All that is necessary is a little care. Apart from the fact that growers who save their own seed are performing a national service, they are, in fact, assisting themselves in that by careful selection of vegetables for seed production they are improving their subsequent crops and ensuring that their seed shall be disease free. It is not suggested that all vegetable growers should go ahead producing seed indiscriminately for sale, because the production of seed *for sale* is now carefully controlled by Commonwealth Regulations, and growers who desire *to produce for sale* must first register, with the Commonwealth Vegetable Seeds Committee at Canberra, and their growing crops must be periodically inspected to ensure trueness of type and freedom from disease. There is, however, nothing to prevent a grower producing seed for his own use, and this is, in fact, encouraged.

The first thing necessary in vegetable seed production is to raise a good crop of vegetables. The crop should be planted so that the seed will reach maturity at a favourable harvesting season. Varieties liable to cross pollination—and most vegetables are—should be planted where contamination from other plants is unlikely to occur.

Pumpkin and Marrow Seed.

Saving of pumpkin and marrow seed is relatively simple, and it is of interest to quote here an extract from volume 1 of *The Queensland Agricultural and Pastoral Handbook*:—

"Selected varieties or strains of these crops are capable of setting a greater number of fruit per vine than other varieties or strains and, therefore, besides providing higher quality fruit, selections are capable of improving yields. Indeed, selected strains are capable of outyielding poor strains by over 30 per cent. The selection of individual fruit for seed requirements in the barn is unwise, since the fruit selected may be from low-yielding vines or may be exceptional individuals on a vine of poorly-shaped fruit. It is therefore necessary for seed selection to be carried out in the field. This is not as laborious as it may

at first appear, since, after the leaves have fallen, individual vines are fairly distinctively traced. Only well-shaped fruit, true to type, and from vines of high yielding capacity should be selected. Ten lb. of pumpkin will yield approximately 1 lb. of seed; consequently, selections need not be extensive. Contrary to general opinion, the age of seed, provided its germination is not impaired, has no adverse influence on yield, for new season's seed has by experiment been shown to bear as heavily as seed of older origin."

After having selected suitable vines, and pumpkins, it is only necessary to scoop out the pulp, remove the seeds, and dry them in the sun.

Cucumber Seed.

Cucumbers reserved for seed should be left on the vines until the fruit is mature and the vines commence to die off. Similarly to pumpkins and marrows, the grower should select a number of vines which are heavy producers of good fruit and mark them with a stick. He can do this while the vines are growing, so that when picking the young green cucumbers from the area for market the selected vines are not interfered with. Seed sown to produce an early spring crop of cucumbers will usually yield good seed for selection.

When the cucumbers for seeding are properly mature they are cut in halves lengthwise and the seed and juice and portion of the flesh scooped out with a large spoon into a wooden tub, barrel, or earthenware vessel. Iron vessels may be used, but are liable to cause a discolouration of the seed. This does not affect the germinating properties of the seed, but spoils its appearance.

When all the cucumbers have been scooped, the vessel is set aside to allow the contents to ferment. Care is necessary during fermentation to ensure that the seed does not become discoloured. Actually, the germinating quality of stained seed is not impaired, and while it is quite suitable for a grower's own use, its selling value is lessened. During fermentation, therefore, the pulp should be stirred frequently. It has been stated that if the juice and seed of a number of very ripe or over-ripe cucumbers is added to the contents of the containers, a yeast ferment is set up and that this ensures a better coloured seed than the seed fermented by moulds. Each grower should gauge for himself when his ferment is ready to wash, so that the seeds are readily separated from the flesh. In a yeast ferment, 24 hours may be sufficient. On the other hand, a mould ferment may require three days or longer. The viability of the seed is not impaired by allowing it to remain in its own juice for up to six days.

The washing of the fermented seed is an easy matter, as most of the seed sinks to the bottom of the container and the pulp may be floated off. It is then only necessary to place the seed in a sieve and give it a final washing with clean water.

The seed should be dried as rapidly as possible to avoid staining. It is best to spread it out in the sun in a very thin layer on a calico sheet or piece of hessian and to keep it stirred frequently until dry. It should then be spread out under cover for about a week before being bagged.

One bushel of fruit yields, when scraped, about 1 gallon of juice, seeds, and pulp; and after fermentation and washing, about ½ lb. of seed will be obtained. Production from an acre of vines is stated to average 200 lb. of selected seed.

Tomato Seed.

The selection of tomato seed is very important for the production of bigger crops of good quality fruit. In going through his tomato patch, a grower should mark plants showing exceptional vigour and which are carrying heavy crops of fruit of good shape.

The fruit on these plants should be allowed to ripen to a complete red maturity before being picked. They should then be squeezed into suitable vessels—wooden for preference, although kerosene tins or galvanised buckets will serve—and set aside in a shed for from four to six days to ferment. Water should not be added to the fresh pulp.

After fermentation, wash the pulp in clean water several times and it will be found that the pulp will float off, leaving the clean seed in the bottom of the vessel. The seed should then be thinly spread out on a piece of calico or clean hessian and dried in the shade. If the seed when dry tends to stick together, it will separate easily when rubbed between the hands.

Ordinarily a half bushel of tomatoes will yield 1 oz. of seed, which will produce approximately 2,000 plants.

French Bean Seed.

The method of saving French bean seed does not need lengthy explanation, as it suggests itself. A section of the bean patch which has good growth and is free of disease should be reserved and not picked, except perhaps for a first picking. The plants should then be allowed to carry a crop to complete maturity, which is indicated by the bean pods turning brown and becoming dry. Before the pods have dried sufficiently to crack and permit the seed to fall to the ground, the whole plants should be pulled and bagged and taken to a shed where the seed can be freed by spreading the plants on a tarpaulin or board floor and beating with a light board. The old plants can then be raked and removed, leaving only the seed and smaller trash. The trash can usually be easily removed by dropping the seed from a height of several feet when a strong wind is blowing. The trash will be blown away, leaving the seed clean. If by chance the pods become too dry to handle without great loss of seed, it is advisable to cut the plants early in the morning when the dew is on them. The bean pods are then less brittle and a great deal more seed can be saved. The plants should, however, be spread out on a tarpaulin in the sun to dry if harvested while damp.

Lettuce Seed.

Lettuce for seed production should be planted during late winter, so that seed will be harvested during the spring or early summer months.

At the outset the plants should be grown similarly to lettuce for the market, allowing 12 inches between plants and 2 feet between rows. Superphosphate should be used for side dressings, however, instead of sulphate of ammonia.

Eventually the heads should be thinned out to about 2 feet apart for seed production, leaving only heads which are healthy and true to type in every respect, though they need not necessarily have large hearts. It is the experience of local seed growers that locally produced lettuce seed being acclimatised gives better results than imported seed.

After the plants have hearted they should not be given too much water. Dry or semi-dry conditions will force them into seed more

quickly. In the case of plants with firm close heads it is advisable to slash deeply across the top of the heads to facilitate the emergence of the flower stalks.

The flowers are yellow, and after pollination and seed formation they have a fluffy appearance and resemble the flowers of the common milk thistle. The seed ripens unevenly, and if the plants are left too long in the ground much of the seed is lost through shattering. Therefore, when the first seed begins to shatter the plants should be cut at ground level and hung or stacked over a tarpaulin in a shed. Most of the seed is thus enabled to mature and excessive loss through shattering is avoided.

When thoroughly dry, the seed may be easily threshed by beating the plants with a light flail. The yield averages about 250 lb. of seed per acre.

As lettuce plants readily cross pollinate, only one variety should be grown at a time.

Imperial 847 and Imperial D are two varieties in considerable demand.

Carrot Seed.

For the fresh vegetable market, carrots may be planted at almost any time of the year, but, in the case of those grown for seed production care should be taken to avoid seed harvesting during the wet season, which normally commences in February. With our warmer climate, it is possible to produce seed in ten to eleven months in Queensland. If seed harvesting is to occur about December and January, therefore, the seed for the production of carrot roots would require to be sown, in coastal districts, not later than February. In the Stanthorpe district seed should be sown not later than August, and the seed harvest should occur before the middle of the following year.

Carrots for seed should be grown in the usual way of carrots for the fresh-vegetable market. The seed is sown fairly thickly in shallow drills, the drills being far enough apart to suit the convenience of the grower. If weeding and cultivation are to be done by hand, 15 to 18 inches is a reasonable distance to allow between the drills, but if horse cultivation is to be used, the distance should be about 2 feet 6 inches. After germination of the seed, the young plants should be thinned out to 4 to 6 inches apart. The roots will be mature in about five months. There are two methods which may be employed at this stage for seed production. The first is to remove all the carrots from the soil, select the best formed roots all of the same size, cut off the tops without injuring the crowns, and transplant them to another piece of well-prepared land. The roots may, if desired, be left spread out in a shed for a few days before being transplanted. It is important that the selected roots be all of the same medium size in order that all seed harvesting may be done at the one time. Very large carrots will seed more quickly than smaller roots, and harvesting will be extended. Carrots with broad crowns should not be taken for seed production, as they usually have big cores, and are therefore not of first quality.

At transplanting, the crowns should remain just above soil level. Holes may be made with a dibble and the carrots thrust in and the soil firmed around them, or drills may be opened and the carrots placed in them and the soil drawn up around them.

As the seed heads develop a fair spread, they should be given room. The roots should, therefore, be spaced 12 to 18 inches apart in the rows,

according to the width of the rows. If hand working, 2 feet is a reasonable distance between rows, while 2 feet 6 inches should be allowed for horse cultivation. In some instances, the roots are set 30 inches by 30 inches apart to allow horse cultivation both ways. The rate of seed production per acre, however, is reduced by wide spacing. If the weather is dry the roots will require irrigating after transplanting, but over-watering should be avoided or the roots may commence to rot. At all times the carrots for transplanting should be carefully handled. They should not be thrown about or bruised in any way. Sometimes severe loss of roots occurs after transplanting, through rotting. This can be offset to some extent by transplanting before the carrots are fully matured.

The second method which may be employed for producing seed avoids transplanting. The carrots are grown in rows in the usual way and when mature are thinned out leaving one, about every 12 inches in the rows, to go to seed, without being disturbed The thinnings are, of course, marketed, or they may be transplanted to new ground.

A drawback to the second method is that the grower cannot be sure that the roots left in the ground for seed are well-formed carrots. He will, however, be able to get a good idea of the quality of the roots in general by carefully observing the thinnings. If most of these are good carrots, he may take it for granted that the balance left in the ground for seed will also be generally good. If, however, there is a big percentage of malformed and poor type roots amongst the thinnings it would be preferable for him to adopt the transplanting method and select his roots.

It is estimated that seed will be ready to harvest in about five months from maturity or transplanting of the roots.

When growing carrots for seed, it is important from the period of maturity or transplanting of the roots onwards that no other variety of carrot be grown for seed within at least a mile of the plot, because when the seed head is produced from the root the flowers will readily cross-pollinate with other varieties and the resultant seed will be a cross. This also applies to the wild carrot which is a common weed in some localities and which should be destroyed in the vicinity of the seed plot.

Carrot seed does not all ripen together, and at the period of maturity should be frequently inspected. If it is left to mature too long, some seed will fall and be lost. On small areas, the seed clusters may be harvested as they ripen over a period of two or three weeks. On larger areas, the whole crop may be harvested when most of the seed clusters are mature. The whole plants are cut in this case and placed in heaps for a week or two to dry. The seed heads are then chopped off and spread out thinly on a clean closely-boarded floor or tarpaulin to dry further, when the seed can be extracted by beating the heads with a light board. Experience has shown that carrot seed is easily threshed on a hot dry day, but is difficult to remove from the seed heads if the weather is dull and damp. To thoroughly clean it of all small sticks and rubbish, carrot seed needs to be sieved through several screens of varying mesh. Thorough cleaning is not, however, necessary when a grower is saving seed for his own use.

An acre of carrots has been stated to produce an average yield of 350 lb. of seed, but this is dependent on the distance apart the roots are grown which, of course, means the number of carrots grown to the acre. If the roots are grown 18 inches apart in rows spaced 3 feet, there will be

9,680 carrots in the acre. The average production from these would require to be about nine-sixteenths, or just over half an ounce of seed per plant to give 350 lb. In practice, it has been found that a percentage of the roots do not go to seed, while on the other hand, some plants have produced recently one and a-half and up to two ounces of seed each.

Cabbage Seed.

Cabbage seed is not of high quality when produced under hot coastal conditions which cause the varieties to deteriorate. However, some enquiries have been received from the Stanthorpe district regarding cabbage seed production, and as that district should produce seed of reasonable quality, a few hints are appended:—

1. Cabbage is subject to ready cross pollination from other members of the Brassica family viz:—brussels sprouts, swede turnip, cauliflowers, etc., and none of these plants should be grown near the cabbages selected for seeding.

2. Normally, seed is best when harvested during the spring and early summer months. Therefore planting should be done in time for the main crop of cabbage to be matured and ready for market during middle to late winter. However, in the Stanthorpe district, plants set out in the very early spring to produce seed in the late summer or autumn would be worth a trial.

3. Even with careful selection of plants, there is likely to be some throwback in the seed, and it is best to make selections each season.

4. Select only uniform, medium-sized plants for best results. Outstanding plants rarely breed true to type.

5. After selecting desirable heads, strip off the outside leaves and dig the plants up, retaining as many roots as possible, and transplant them to an isolated position where there is no risk of cross pollination. When the plants are well rooted, slash the heads across the top to weaken the leaves and allow the seed heads to push through. When the seed heads are in full flower the bottom heart leaves can be stripped from the plants.

6. Keep the plants sprayed against pests.

7. The seed is ready to harvest when the pods crack at the slightest pressure of the fingers. If allowed to remain too long, the pods will open on the plants and most of the seed will be lost.

8. Cut the whole of the plants at the correct stage of seed maturity, and hang them up in an airy shed (with a tarpaulin under them) and allow them to dry thoroughly. During this process much of the seed will fall, but will be caught by the tarpaulin. When the plants are quite dry, shake out the rest of the seed and place it in a hessian or cheese cloth bag, which should be hung up in a dry, airy place, such as under the house. Do not store too close to a galvanised iron roof. Disinfection is not necessary and the seed will keep good until the following year. A single plant will yield an average of 3 oz. of seed.

9. A second method of seed production is to mark selected plants and, after the heads of these have been cut for market, to dig up and transplant the stumps. These, later, will throw seed heads which are treated as described.

Cucumber Growing.

C. N. MORGAN, Fruit Branch.

CUCUMBERS grow very well in Queensland. The vines like warm growing conditions though very hot weather tends to burn and consequently defoliate the plants, exposing the cucumber fruits, and thereby rendering them liable to sunburn. Frost will kill the vines and they should therefore not be grown during winter on low lying land.

The main planting is carried out in southern coastal districts during the months of July, August and September, and a further sowing is made during February and March in areas not subject to frost. On the Tablelands, as for instance, Stanthorpe, seed may be sown from September to January, whilst in northern coastal districts seed may be sown throughout the year except during the very hot months.

Like most other vegetable crops, cucumbers require to be grown quickly in order to obtain good crops of crisp tender fruit. On land which is not over fertile, five (5) to six (6) cwt. of a quick acting commercial mixture should be used as a base dressing, followed by a side dressing at the rate of two (2) or three (3) cwt. of a similar quick acting fertiliser, just before the plants commence to run. If using land which has just grown a winter crop, say of cabbage, which has been heavily fertilised, then it is only necessary to use half the quantity of fertiliser. All that would be necessary in this case, would be to apply fertiliser along the rows where the cabbages have been removed, scuffle the area well a couple of times, open shallow drills and sow the seed. Seeds should be sown sufficiently thick in the drills so that when large enough the young plants may be thinned out to one about 18 inches to 2 feet apart. When sown close together in this manner, the vines cover the ground quickly, affording protection, and additionally they usually fruit earlier. When grown in rows approximately 3 feet apart, and spacing the plants as above, 2 lb. of seed should be sufficent to plant an acre.

Another method of planting is in what are known as "pits" or "hills." These terms are used to represent groups of three or four plants. At one time, the seed was sown always on small hills of soil formed by throwing together two or three shovelsful of soil, hence the name "hills." Unless, however, the land is inclined to be wet there is no need to follow this practice. The idea of planting in "pits" or "hills" is to fertilise small patches of ground about four (4) feet apart, and to sow several seeds in each, about a inch below the surface. About four (4) plants are allowed to grow from each "hill."

Should the vines send out their runners to a distance of two or three feet without setting any cucumbers, fruiting may often be assisted by pinching off the tips of the runners.

Vines of all descriptions are particularly subject to damage from heavy winds. If the site is exposed therefore it is well to provide a breakwind of some kind. This applies more especially with an early crop sown, say in July, which might be exposed to the westerlies, usually experienced in August. A little thought on the part of the grower will soon overcome this problem. For example, thickly sown rows of a quick growing crop such as saccaline grown early in the year

at say half a chain intervals, and allowed to remain for the cucumber crop, will effect a surprising amount of shelter from winds. If the breakwind tends to grow too high, and to shade the vines, it can easily be lopped back with a reaping hook to a height of about thirty (30) inches. It is desirable to have rows running north and south for the early crop to obtain maximum sun and protection.

Cucumbers usually take about three (3) months from seed sowing to harvesting. The fruit should be picked when nearly full grown, before the seeds harden, and the skin begins to turn yellow.

Varieties recommended are Early Fortune, Kirby's Stay Green, Black Diamond and White Spine.

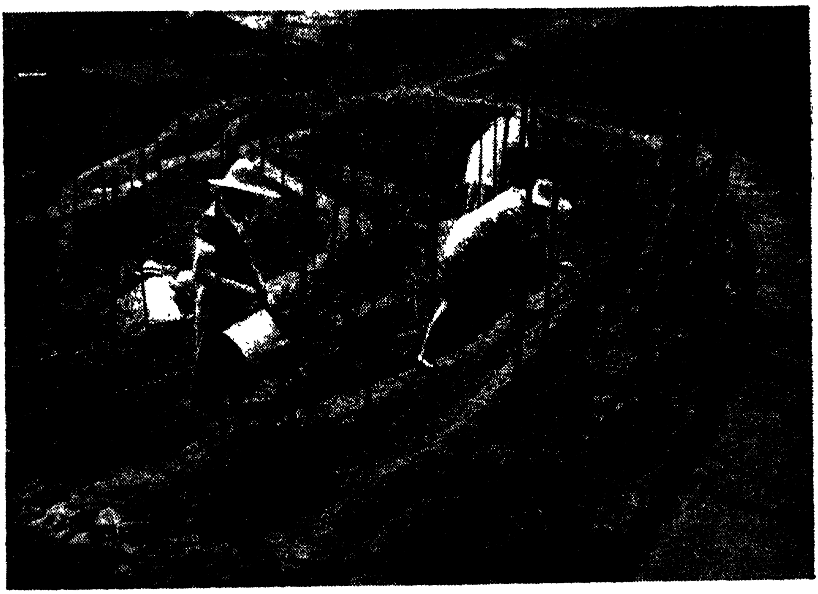


Plate 20.

A "Dig for Victory" Vegetable Garden in a Brisbane Suburb.—A group of girls employed in city offices, undaunted by the natural poverty and steep slope of the allotment, established a systematic layout providing for controlled drainage and the prevention of erosion. Continuity of production of salad vegetables has been maintained from season to season. Several "Dig for Victory" groups have established productive vegetable gardens in suburbs of Brisbane with the aim of supplying sick and convalescent Diggers with garden-fresh green vegetables continuously, and have succeeded so well that, in the aggregate, produce to the value of many hundreds of pounds have been supplied to military hospitals as a practical spare-time contribution to the national war effort.

APPLIED BOTANY

Edible Trees and Shrubs.

I. The Brown Kurrajong.*

W. D. FRANCIS, Botanist.

THE Brown Kurrajong is most commonly seen as a shrub or small tree in the regrowth of felled scrub or rain forest. It attains a height of about 40 feet and a stem diameter of about 1 foot. The seedlings generally come up in very large numbers after the scrub fire.

It is allied to the common Kurrajong† and the Bottle Tree‡, which are more common in inland parts of the State. These three important native fodder trees belong to the same plant family.§

The shrubs and young trees have a brown bark, the surface of which is marked by pale spots.|| The bark is also very fibrous, and long strips of it can be removed from the stem and branches. The leaves are placed alternately on the branchlets. The leaves are attached by a stalk ⅜-¾ inch long. The leaf blades are egg-shaped or heart-shaped in outline, broad and often indented and unequal-sided at the base, the margins mostly toothed, underside pale and finely hairy. The leaf blades measure from 3 to 6 inches long and one and a-half times to twice as long as broad. The inflorescences are mostly situated on the branchlets opposite to the insertion of the leaf stalks. The flowers are white, and each measures about ¼ inch diameter when expanded. The flowers mature into a round capsule measuring ¾-1 inch diameter, including the ¼ inch long soft projections which cover it.

The Brown Kurrajong is widely spread in the coastal area from the New South Wales border to Cape York Peninsula. It does not penetrate inland far beyond about 100 miles. It is also found in New Guinea, the East Indies, and the Pacific Islands.

Stock are very fond of the leaves and young twigs. The partiality of cattle is well shown by the way in which they break down the tall shrubs and young trees in order to get at the leaves.

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* *Commersonia bartramia* (synonym *C. echinata*).

† *Brachychiton diversifolium.*

‡ *Brachychiton rupestre.*

§ *Sterculiaceae.*

|| *Lenticels.*

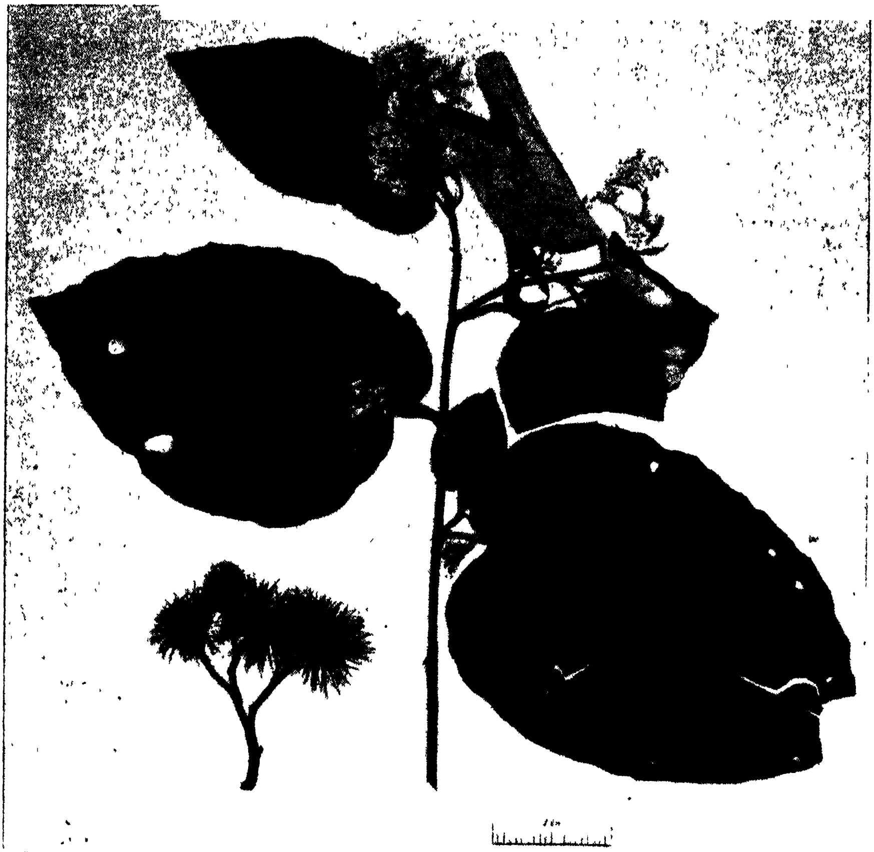


Plate 21.
THE BROWN KURRAJONG FLOWERING TWIG AND FRUITS.

ANSWERS.

Selections from the Government Botanist's outward mail.

Trees Suitable for the Lowood District.

Cape Chestnut, Crow's Ash, Moreton Bay Chestnut, Camphor Laurel, Jacaranda, Insignis Pine, Kurrajong, Pepper Tree, White Cedar, Lemon-scented Gum. Most are obtainable through ordinary commercial channels or from the City Council Nursery.

Trees for the Goondiwindi District.

Bottle Tree (narrow-leaved variety), Kurrajong, Native Bauhinia, Sugar Gum, Scented Gum, Tristania or Lophostemon, Pittosporum, Portuguese Elm, Olive, Camphor Laurel, Pepper Tree, White Cedar, Cape Chestnut, Jacaranda (requires protection in early growth), and Pines (as recommended by the Forestry Department).

Quinine Berry.

M.L.K. (El Arish, N.Q.)—

The specimens from Dimbula are of the Quinine Berry, the same as the Georgetown berries. Neither is a satisfactory substitute for quinine. At present the Physiology Department of the Queensland University is working on the Leichhardt Tree. This tree belongs to the same family as the Quinine Berry and the bark is used in North Queensland by bushmen as a reputed cure for malaria and other fevers.

PLANT PROTECTION

The Potato Flea Beetle.

A. R. BRIMBLECOMBE, Assistant Research Officer.

AN outbreak of the potato flea beetle caused serious losses in the 1943 autumn crop in the Lockyer and South Burnett districts. This insect was first recorded from potatoes in Queensland in June, 1896, near Beaudesert, and has since been collected at other centres along the east coast as far north as the Atherton Tableland. Although the beetles occur in potato crops almost every year, serious damage was last recorded in 1916 and crops are normally produced without any safeguards against this pest. Consequently, in the autumn of 1943, flowering was in progress before the damage became apparent.

Life-cycle Stages and Habits.

The life-cycle of the potato flea beetle includes the usual four stages—namely, egg, larva, pupa, and adult. The adult (Plate 22; fig. 4) is a shining, metallic-blue, oval-shaped beetle measuring about an eighth of an inch in length. The rather stout hind legs enable the insect to leap considerable distances when disturbed, hence the name, flea beetle.

The eggs (Plate 22; fig. 1) are pale-yellow in colour, oval in shape, and about a fortieth of an inch in length. They are laid singly or in groups among the hairs in the grooves on the upper surface of the leaf stalks and in cracks and abrasions on the stems.

The full-grown larva (Plate 22; fig. 2) is elongate, cylindrical, almost half an inch in length, and pale-cream in colour, with a brown head. It can be readily separated from the larva of the potato tuber moth, which also attacks the stems, by the absence of (*a*) the black colouring on the segment just behind the head and (*b*) the short caterpillar legs on the abdominal segments, which are typical of the latter insect. When the flea beetle grub is full grown, it leaves the plant, enters the soil, and constructs a small earthen cell, in which it later changes to a pale-cream coloured pupa (Plate 22; fig. 3). The adult beetle subsequently emerges from this pupa and makes its way to the surface of the soil.

Details of the life-cycle of the potato flea beetle are not yet available, and it is assumed that the period required for the completion of its development is comparable to that of similar insects elsewhere. If this is so, a single generation will extend over about two months during the summer and a much longer period in the winter.

Nature and Extent of Damage.

The potato plant is damaged by both the adult and larval stages of the flea beetle. The adults feed on the upper surface of the foliage, eating small, irregularly-shaped holes in the leaves (Plate 23). When

they are present in large numbers they reduce the amount of foliage and possibly affect the yield of tubers; even so, a payable crop is usually obtained. Damage by the larvæ, however, is far more serious, because, on emerging from the eggs, they bore into the stems. At first they tunnel in the soft outer tissue, but as they grow larger they prefer to tunnel in or near the harder tissue through which food supplies are transported in the plant. Larvae arising from eggs laid on young plants enter the stem at or near ground level and work downwards into the root. Later in the season, attacks occur elsewhere on the stem. The beetles can apparently live for a long time, and egg-laying may therefore be spread over several weeks during which the larval population in the stem steadily increases. The damage at or near ground level is particularly serious, for it is here that food supplies pass from the roots to the leaves and from the leaves to the tubers. The damage inflicted not only interrupts the flow of these foods but also allows the entry of rot organisms; these are associated with a severe wilt when the plants are flowering from which they seldom recover.

Attacks may commence in a portion of the field which is adjacent to areas that have provided shelter for the beetles. However, they are capable of flying, and it is not unusual for the damage to be evenly distributed throughout the whole crop. Besides potatoes the flea beetles feed on the foliage of tomatoes, egg-plant, and several related weeds. One of these, the black berried nightshade, often occurs in potato fields and is the only other plant in which the larvae have been found.

Some growers consider that the recent extensive development of irrigation may have contributed to the flea beetle attack in 1943. The most severe damage has certainly occurred on irrigated crops, but non-irrigated areas have also suffered considerably. Differences in the amount of damage were also apparent between varieties of potatoes on individual farms, but these were not consistent from farm to farm. Plant-

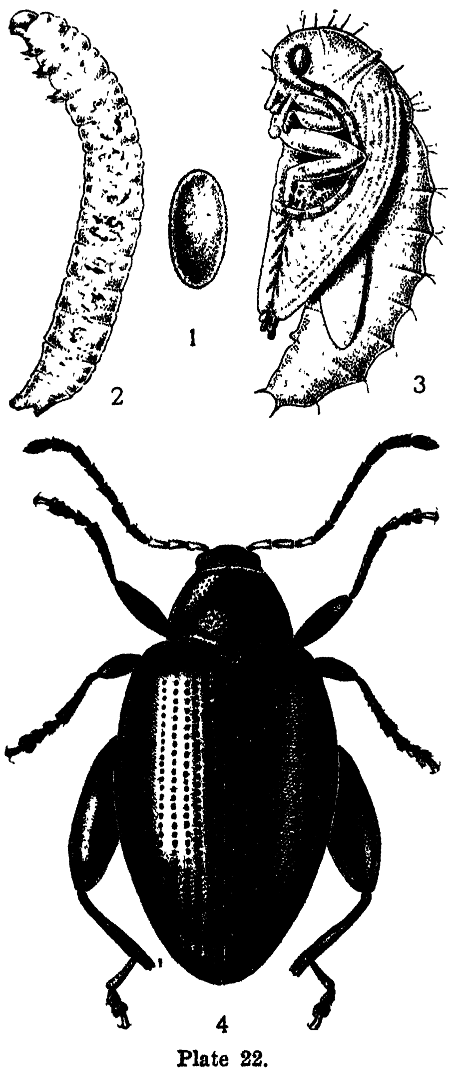


Plate 22.

Potato Flea Beetle: Fig. 1—egg × 20; fig. 2—larva × 6; fig. 3—pupa × 11; fig. 4—adult × 20. *Drawings by William Manley.*

ing dates did, however, appear to affect the amount of loss sustained by the grower. Crops planted in January were almost wiped out; those planted in early February suffered more than those planted late in the month, and March plantings almost completely escaped damage.

Plate 23.
POTATO FOLIAGE DAMAGED BY FLEA BEETLE ATTACK.

Control.

Normally the damage does not extend beyond that caused by the adult beetles, against which control measures have so far been unnecessary. For this reason a control programme for outbreaks in which the larvae are mainly responsible for the damage cannot at present be recommended. Pending the results of experimental work, arrangements for which have been made in this year's spring crop, growers who wish to do so may spray their crops with lead arsenate prepared by adding 3 lb. of lead arsenate to 100 gallons of water. This treatment will have no effect on the larvae once they have become established in the stems, but it should exercise some control over the adult beetles and young larvae recently emerged from the eggs. Treatment should only be applied if the beetles are seen on the plants, and spraying at seven to ten days' intervals, so long as they are present, may meet requirements.

Home-Made Cuprous Oxide Mixture.

F. W. BLACKFORD, Assistant Research Officer.

HOME-MADE cuprous oxide mixture, previously known to many farmers and orchardists under the somewhat less accurate name of colloidal copper, is rapidly proving a very useful substitute for Bordeaux mixture as a fungicidal spray. In experiments it has proved as efficient as Bordeaux mixture for the control of all fungous diseases so far dealt with, and in the case of some crops, such as citrus and tomatoes, it has the added advantage that it does not materially adversely affect plant growth. Owing to the comparatively recent introduction of this spray, opportunities have not been obtained for testing its adaptability to all crops on which Bordeaux mixture is normally used. Growers are therefore advised to try the spray on a small scale at first when the crop reactions to the new spray are unknown.

Formula.

The spray consists of a stock solution which is allowed to age and is diluted, as required, to the concentration recommended. The stock solution is prepared from solutions A and B, according to the following formula:—

Solution A.		*Solution B.*	
Bluestone (copper sulphate)	3 lb.	Caustic soda	15 oz.
Molasses	3 pints	Water	9 pints
Water	12 pints		

The above formula will make up 3 gallons of stock solution. The formula for the spray has been so calculated as to obtain a neutral or very slightly alkaline solution. This is one of the factors which most probably account for the reduction in the injurious effects on the crop when this spray is compared with Bordeaux mixture, which is extremely alkaline. Acid sprays are dangerous, as a burn is likely to follow their application, and highly alkaline sprays have a detrimental effect on crop growth. Testing the mixture with litmus paper is not possible, owing to the heavy nature of the precipitate, but phenolphthalein may be used. This is readily procurable from practically any local chemist; a ½ oz. of it is dissolved in 1 pint of methylated spirits. Pieces of blotting paper are thoroughly wetted with this solution and then allowed to dry. The paper is then cut into strips approximately 1 inch by ⅜ inch, and these are used for testing the spray. The paper as prepared is white, and if the mixture is too acid—i.e., if an excess of bluestone is present, it remains white. A satisfactory mixture turns the paper a pink colour, but if an excessive amount of caustic soda is present it shows a definite red colour. The phenolphthalein-methylated spirits solution does not deteriorate. The following precautions should be observed in order to obtain a satisfactory mixture:—Accurate weighing; the use of fresh caustic soda; the discarding of caustic soda which has absorbed water from the air and formed hard cakes; and after using, the resealing of the tin of caustic soda so as to render it airtight, thus keeping the soda in good condition.

Bluestone may be obtained as coarse crystals or as smaller crystals known as fines. For the sake of ease in dissolving, the fines are to be preferred. Caustic soda may be obtained in the powdered form or as flakes. The latter is preferable, as it is easier to detect whether the flakes have been affected by being exposed to the air.

The cost of the cuprous oxide mixture exceeds only slightly that of Bordeaux mixture of a comparable strength of copper sulphate, being approximately only 3d. more per 40 gallons of spray.

Preparation of Stock Solution.

The bluestone should be dissolved in the required amount of water, and as this will take some time if cold water is used, it is preferable to use boiling water. The bluestone crystals are placed in a piece of sacking and agitated in the hot water. A wooden barrel is the most suitable container for holding this solution, as iron is corroded by it; iron drums well coated with pitch will serve as a makeshift. When the solution is cool, the molasses is added and it is well stirred until thoroughly mixed.

The caustic soda is then dissolved in the required amount of water. A kerosene tin will serve for this purpose. The soda should be added to the water already in the tin, as, if the water is poured on the soda, there is a tendency for a part of the soda to form a solid cake, which is slow to dissolve. The solution will become quite hot during the process of dissolving

When cool, the caustic soda solution—i.e., solution B, is added to the bluestone-molasses solution—i.e., solution A, stirring vigorously the while. At first stirring is easy, but in time the mixture thickens and stirring becomes difficult. Stirring is continued until the mixture is once more comparatively easy to stir.

The depth of the mixture is marked on a wooden rod and the solution is then covered to prevent excessive evaporation. The solution is allowed to stand at least a week or preferably longer before using, when the colour will have changed from dirty green to yellowish. It is a good plan to give the mixture an occasional stirring during this period.

Before using this stock solution, any water lost by evaporation, as shown by the marked rod, should be replaced, preferably by rain water, and the solution should then be well stirred. It is often found that a fungus has formed a thick blue-green layer on the surface. This does not affect the spray in any way, but should be lifted out, as it causes clogging of the spray nozzles. The mixture will remain in good condition for a long period, providing it is not allowed to dry out. A batch twelve months old on examination appeared in quite good condition.

Dilutions for Spraying.

(1) Tobacco seedlings—3 pints stock solution to 10 gallons of water.

(2) Tomato—
  (a) Seedlings—4 pints stock solution to 10 gallons of water.
  (b) Older plants—4 gallons stock solution to 40 gallons of water.

(3) Citrus—3 gallons stock solution to 40 gallons of water.

Preliminary investigations have suggested that a spray of half the above recommended strength—i.e., 3 gallons to 80 gallons, may be satisfactory for the control of citrus diseases. When substituting for Bordeaux mixture, a good indication of the strength to use is the number of pounds of bluestone in the Bordeaux mixture. Thus, if a 3-2-40 strength Bordeaux mixture was used previously, 3 gallons of the stock solution are added to 40 gallons of water when cuprous oxide mixture is used.

Spreaders.

In the case of citrus and tomatoes, no benefit of practical importance has been obtained by mixing spreaders with this spray. When it is used on tobacco seedlings, however, genuine potash soft soap may be added as a spreader and can be used at the rate of 2 lb. of the soap to 40 gallons of the spray. The best procedure is to dissolve the soap separately in a small portion of the water, which has been set aside for that purpose, the water being heated if necessary. This soap solution is then added to the rest of the spray, the spray being pumped back into itself to obtain a good frothy mixture; as an alternative to pumping, the mixture may be stirred briskly. Proprietary spreaders, such as Agral, may also be used with this spray.

Combination Sprays and Compatibility.

Lead Arsenate.

Lead arsenate may be combined with cuprous oxide mixture for combating fungous diseases and chewing insects. The lead arsenate should be mixed to a cream with water and added to the prepared spray. Excess caustic soda will liberate arsenic in solution, and this may lead to injury to the plant tissue; therefore the directions discussed under the heading of "Formula" should be followed closely when using this combination. Soap should not be added to this mixture.

Fumigation.

The effects of the fumigation of citrus trees with calcium cyanide *after* the use of cuprous oxide mixture have not yet been fully investigated. However, experiments show that from 5 to 6 inches of rain must fall after a spray of the 3-40 strength has been applied before fumigation with calcium cyanide may be considered safe. If the 3-80 strength were used, from 2 to 3 inches of rain would be sufficient. Fumigation *before* spraying with the cuprous oxide mixture is quite safe, though it is considered best to allow an interval of a week to ten days between treatments.

Zinc Sulphate Sprays.

For the control of mottle leaf of citrus, a zinc sulphate-hydrated lime spray made up according to the 4-2-40 formula is recommended. Cuprous oxide mixture may be added to this spray at the usual strengths. Where spraying for insect control is practised, it would be quite safe to apply the zinc sulphate-hydrated lime and cuprous oxide combination. Caution, however, should be exercised in its use if insect pests are controlled by fumigation.

It has been suggested that the presence of hydrated lime in a mixture may be a factor contributing to injury by fumigation following the use of certain copper sprays. Hence the use of a cuprous oxide-zinc sulphate-hydrated lime combination may predispose the trees to fumigation injury. However, experiments have shown that caustic soda may be substituted for hydrated lime in this combined spray at the rate of 4½ oz. to 1 lb. zinc sulphate, thus eliminating the undesirable factor. Care should be taken to weigh out the amount of caustic soda quickly and accurately, as correct weight is necessary to obtain the neutral mixture required. In any case, it would be wise to fumigate cautiously after such a mixture until more is known of the interaction between copper sprays and fumigation.

Lime Sulphur and Colloidal Sulphur.

Copper sprays should not be mixed with lime sulphur, as a reaction occurs between the copper and the calcium poly-sulphides in the lime sulphur, resulting in the formation of a dirty grey precipitate of sulphides of copper and sulphur. While no harm would result from spraying a crop with such a mixture, the efficiency of both sprays is impaired. Where a sulphur and copper combination is desirable, e.g., for the control of mites and target spot in tomatoes, commercial colloidal sulphurs may be mixed with home-made cuprous oxide.

An application of a strong lime sulphur spray during late winter is recommended for the control of white louse on citrus, and cuprous oxide mixture is first applied for disease control in spring when one-half to three-quarters of the petals have fallen. This application of copper may follow that of the strong lime sulphur after an interval of a week or more. The reverse order, copper followed by the lime sulphur, though not likely to be used, is not recommended, as reactions similar to those occurring when the sprays are mixed will take place on the leaves. When, however, later in the season, the weaker strength of lime sulphur is used for the control of Maori mite, this effect is not so serious and the lime sulphur may follow the copper spray.

Colloidal sulphur may be used prior to, or following the copper application without any detriment to the efficiency of either spray.

Soap, Oil, &c.

Although the use of a cuprous oxide-soft soap combination has met with success in the control of blue mould of tobacco, it is not generally recommended to mix soap with cuprous oxide. If white oil is to be added to cuprous oxide for the control of scale insects on citrus, the addition of soap should definitely be avoided because the molasses used in preparing the cuprous oxide contains lime and other salts, and these will react with the soap to form an insoluble curd. If white oil is then added the emulsion is destroyed and free oil rises to the surface carrying with it the insoluble curd formed from the soap, resulting in a thick paint-like scum. The free oil would cause severe burning. To overcome this difficulty, the following formula for an alternative cuprous oxide mixture has been devised for use in cases where it is necessary to mix cuprous oxide with the sprays mentioned in the following paragraph:—

Solution A.		*Solution B.*	
Bluestone	3 lb.	Caustic soda	15 oz.
Honey	½ pint	Water	9 pints
Water	14½ pints.		

Third-grade honey is quite suitable for use in this mixture, and the increased cost over the molasses formula on page 97 is very small, approximately ¼d. per 40 gallons of spray.

The solutions are mixed and allowed to age in exactly the same fashion as described on page 98. This mixture may be combined with soap or any of the citrus scalicides, soap-washing soda, soap-washing soda-white oil, white oil or resin-caustic soda-fish oil, where the control of both scales and fungous diseases is desired. To prepare the combination spray, the scalicide is made up according to the usual formula and then the cuprous oxide mixture (using the honey formula) is added at the rate of 3 gallons of stock solution to 40 gallons of spray or 3 gallons to 80 gallons if the weaker strength is used, stirring briskly.

Nicotine Sulphate.

For the control of soft-bodied insects and fungous diseases, nicotine sulphate may be added to cuprous oxide mixture at the usual strengths. As, however, it is usual to add soap to liberate the nicotine, it would be perferable to use the honey formula for the cuprous oxide mixture.

Commercial Preparations.

Cuprous oxide is also being marketed commercially. The material, which is in powder form, mixed with a wetting, spreading, and sticking agent, may be stirred into the required amount of water and used as a spray. It can be applied wherever the home-made spray is recommended, except in the case of citrus, when fumigation is practised for pest control. As the spray sticks so well and also because of the chemical composition, it is advisable to rely on the home-made mixture for use on citrus fumigated for pest control.

Copper oxychloride and basic copper sulphate are also sold as powders for use as sprays. A limited amount of work on tomatoes has shown these to give quite effective control of disease and to possess the several advantages of home-made cuprous oxide mixture. However, where citrus trees are fumigated for insect pest control, these sprays are not recommended owing to the possibility of the trees being rendered liable to injury.

Plate 24.

TOBACCO SEED-BEDS DESIGNED FOR BENZOL TREATMENT.—When benzol is being evaporated for the control of blue mould, the calico covers shown to the left of the beds are stretched over the wooden framework.

Merino Flocks.

J. L. HODGE, Instructor in Sheep and Wool.

AT the present time Queensland is carrying well over 25,000,000 sheep, a record number for the State. When it is realised that of this number 98 per cent. are of the merino breed, it will be recognised what an important influence this breed has on the pastoral economy of the State.

To attain a full measure of success with a merino flock, it is imperative that the right type of sheep should be chosen for the country grazed. For instance, it would be definitely wrong to introduce the finest of merinos to our far distant Western lands where periodic droughts occur and there are often considerable distances for sheep to walk to water. On this class of country a more robust type of merino, strong in constitution, and one more or less able to forage for itself is required. The character of the country, then, should be carefully considered before deciding on the merino type most likely to be successful.

Establishing a Flock.

An opinion on the purchase of station-culled young ewes, as against breeding ewes culled for age from the same property, is often sought. Apart from price considerations, it is said unhesitatingly that the breeders are the better purchase and probably much less costly. This applies especially where it is the practice to sell culled-for-age ewes each year. The point is that the station practising culling, as a matter of policy, would never have kept the ewes unless they were well worth while. Then, again, they may not be too old. In the case of the young culls, it is very evident that they were thrown out for some fault. Then why should the new owners perpetuate the fault by breeding indiscriminately from them? Some young culls may be far better than others, but in any culled flock these again want careful examination before being admitted as breeders.

To carefully select the ewe flock is only one end of the business. The choice of rams to suit the particular type of ewe is of the utmost importance. Where a blood line has been successfully established in a particular locality, and ewes of this line are being used, it is a good plan to stick to this strain when choosing rams. This does not necessarily mean a choice from the same stud. Out of this blood line must then be chosen the type required. It is too common a practice for a ram breeder, when selling to a client, to yard a certain number of rams, and to give the purchaser a run of the number required out of the total

yarded. This is evidently wrong from the breeder's point of view. Although the rams themselves may be all right, and quite suitable as sires elsewhere, it is quite possible that a number of the run should never see the ewes. Had the ram breeder typed his rams into fine, medium, and strong, then the purchaser has the opportunity of getting, not only the blood he wants, but the type and the blood.

Queensland rams have been greatly improved in the last few years, and a breeder should be able to satisfactorily fill his requirements from some flock in this State. The matter of the right rams to "nick" a particular flock is so important that the breeder, if he lacks the necessary knowledge to select his own rams, would be well advised to pay a man of recognised ability to make the selection for him. Under average conditions or worse, a flock in Western Queensland tends to run out and become finer. Therefore, it is necessary in selecting rams to choose those slightly broader in the fibre than the ewes with which they are to be mated.

Provided the right rams are selected, the price, within common sense limits, is of secondary importance. The purchase price shoud be regarded as an economy rather than as an extra expense. Three guineas a head may be wasted money, while £5 5s. a head may be cheap. After all, what is aimed at in the progeny is the return they will give per head rather than the figure realised per lb.

Other Points in Flock Management.

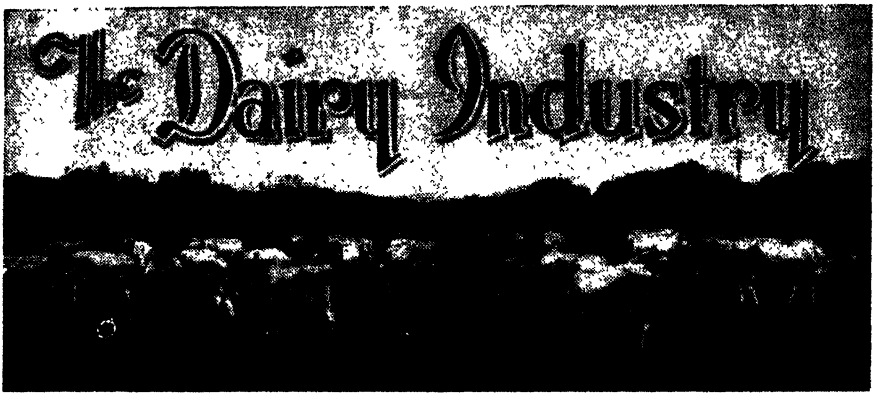
Conformation in merino sheep should receive more attention than is usually given to it. The covering is, of course, of the utmost importance, but not everything as some growers seem to think. The maintenance of the health and condition of the flock is a prime necessity, if satisfactory wool returns are to be expected. A thousand well-fed sheep will return just as much as 1,500 half-starved sheep.

There is not, speaking generally, sufficient done in the matter of change of pasture. Too often one sees sheep shorn, put into a paddock, and left there for long intervals.

The choice of mating time should be governed by experience in the particular locality. A time chosen for one district may prove unsatisfactory in another. Blowfly attacks, too, have to some considerable extent influenced graziers in the choice of a suitable time for lambing.

At weaning time the young sheep should have the best grazing on the property. From weaning time to eighteen months old is the most tender age of a sheep. To attain proper growth and development, the young sheep must be soundly nourished. Above all, never wean into a seedy paddock.

If weaners are shorn as such, allow as nearly a full growth of wool as possible before the job of culling the young ewes is undertaken.



Cream Defects—Probable Causes and Prevention.

E. B. RICE, Director of Dairying.

BACTERIA thrive in milk; therefore, every care should be taken to remove or minimise sources of contamination of milk and cream. Probable causes of defects in cream and means and methods of prevention are set out as follows:—

Overripe, Sour.—Excessive acidity, due to failure to cool cream; keeping cream too long on the farm or infrequent delivery to factory; use of unclean utensils, separator or milking machine; separating cream at too low a test; careless dairy methods.

Prevention.—Use thoroughly clean and near-sterile utensils; cool cream and keep cool; deliver to factory as frequently as practicable; separate cream at 38-42 test in summer and 34-38 test in winter; stir cream occasionally.

Fermented, Gassy, Yeasty.—General uncleanliness, particularly due to yeasts and gas-forming bacteria; washing separator only once daily; improperly cared for milking machines; wood stirrer; mixing hot and cold cream; dirty yards and bails. Infrequency of delivery and high temperatures aggravate this condition.

Prevention.—Production methods should be carefully revised; remove manure from yard daily; do not use rag strainers or wash-up cloths; use only seamless utensils; clean utensils, clean hands and udders and cooling are the keynote of control.

Unclean, " Off " Flavour, " Tainted."—Faulty shed methods, particularly use of cheese-cloth or rags as strainers instead of cotton-wool fitter discs; dirty milking machines; dirty udder cloths; wet-hand milking; imperfectly cleansed utensils; use of cloths for washing-up; dirty wash-water; leaky milk float in separator; unwashed separator; wooden stirrer; dirty manure-laden cowyard; milking machine airline; cows in season.

Prevention.—Milk with clean hands; wash udders; reject cloth strainers and wash-up cloths, and use only brushes; use near-sterile utensils; cool cream; renew perished inflations and rubber tubing; deliver cream frequently to factory; follow advised procedure in cleaning and

steam sterilizing for milking machines; reject abnormal milk from cows in season.

Cheesy.—General insanitation (cheesy cream is always graded second or rejected); straining milk or cream through cheese-cloth; unclean machines. High temperature and infrequency of delivery will accentuate this defect.

Prevention.—A complete overhaul of shed practices is indicated; avoid cheese-cloth strainers and use cotton filter discs; keep brushware clean by washing and drying; use only seamless utensils.

Rancid.—Result of advanced undesirable bacterial fermentation; cream is low second grade or reject quality.

Prevention.—Same methods as for cheesy defect apply.

Metallic.—Holding cream in vessels, the tinning of which is imperfect; rusty utensils; pitted milking machine pipelines; using kerosene tins for buckets.

Prevention.—Have faulty utensils retinned; avoid using rusty, broken or dented utensils; all dairy utensils should be seamless.

Tallowy Oxidised.—Advanced stage of metallic defect; exposure of cream to direct rays of sun; placing cream in cans kept in sun; cream of excessive fat content.

Prevention.—As for metallic defect. Protect cream from the sun's rays; separate cream at 38-42 test in summer and 34-38 test in winter. Stir cream occasionally.

Stale.—Cream kept too long on farm; high temperatures aggravate this defect.

Prevention.—Cooling of cream and frequent delivery to factory; cleanly shed methods.

Ropy.—Result chiefly of bacteria in water supplies, especially in swamps and dams. Cows pick up germs on udders, which later establish themselves in utensils and bails.

Prevention.—Stop access of cows to possible sources of contamination; wipe udders well (chlorine is advised); whitewash bails; clean up yard; thoroughly sterilize utensils and rinse them with chlorine solution (100 p.p.m. is advised).

Curdy.—High acidity caused by holding cream at too high a temperature; failure to blend cream properly; skimming too thin; leaving skimming dishes out of separator bowl; neglect to stir cream.

Prevention.—Separate at 34-38 test in winter, 38-42 test in summer; cool cream; do not mix hot with cold cream; stir cream four times daily.

Cowy.—Unclean bails and yards; milking too soon after calving; milking unhealthy cows; dirty udders and hands; bad drainage.

Prevention.—Strict cleanliness is essential; keep cream in dairy away from bail air and cowyard dust; sweep bails daily.

Albuminous.—Abnormal milk due to cow's physical condition; using cream of freshly calved cows; late lactation cream; cows wading in swamps.

Prevention.—Reject abnormal milk; wash thoroughly udders of cows which have waded in swamps (chlorine solution 100 p.p.m. is advised).

Machine Taint.—Unclean and fat-saturated inflations and rubber tubing; unclean air pipeline and vacuum tank.

Prevention.—Carefully wash and steam-sterilize milking machine; renew inflations and tubes promptly; clean vacuum tanks and airline; hold inflations in weak lime-water between milkings.

Slimy.—Flushing separator bowl with hot water; use of too small separator; unhealthy cows; access to stagnant water; newly calved cows.

Prevention.—Do not flush separator bowl with water; fence cows from stagnant water; reject milk of unhealthy cows.

Cowyard.—This and cowy flavours are alike. Caused by muddy cowyard; bad drainage; smells of manure or bail floor drawn through teat cups; or holding cream in surroundings of dirty cowyard, near drains, smells of pigsties, manure heaps, and calf pens; storing other goods in dairy; general insanitation; often a conglomeration of bad flavours, but none as pronounced as to be distinguished individually.

Prevention.—Take the required precautions during production and after; take care to avoid contamination from the sources indicated. An overhaul of production methods is indicated if the cause is general insanitation.

Bitter.—Often due to something eaten by cows, such as wild convolvulus, quinine plant, thistles, lupins, vetches, and lotus major (when in flower); milk from cows late in lactation; protein-attacking bacteria.

Prevention.—If due to food consumed, graze such pastures immediately after milking and keep cows away from suspected paddocks three hours before milking.

Feed Flavours.—Rank pasture; storage near strong-smelling food like silage, lucerne, clovers (green, and as hay), mouldy or musty hay, green barley, green rye, green cowpeas, turnips, or onions.

Prevention.—If practicable, flavour-tainting feeds should be fed straight after milking; remove cows from such feeds at least three hours before milking. Aeration and cooling tends to diminish feed flavour.

Weedy Flavours.—Common cream-tainting weeds are mustard weed, carrot weed, cress, hexham, pepperwort, lantana, stinking roger, New Zealand spinnach, turkey berry, chillie weed, wild turnip, and penny-royal.

Prevention.—Complete removal of taint cannot be effected even in the factory; hence cream is usually second grade. Aeration and cooling may reduce the intensity of the defect. Pasture management is the only remedy.

Absorbed Flavours.—Caused by absorption of odours from nearby surroundings; engine exhaust fumes; coal tar; oil from engine or on separator block; smoke from dairy fire; paint; vegetables or fruit stored in dairy; kerosene; benzine.

Prevention.—Keep milking shed, separator room and dairy tidy; do not use the shed or dairy for storage of other than milk or cream: lead exhaust away from dairy; and keep strong-selling substances away from cream.

Disinfectant Flavours.—Odorous disinfectants used in shed or for washing cow's teats; handling disinfectants and not washing hands before milking; using salves, carbolic compounds, or other strong disinfectants on cows' udders.

Prevention.—Avoid using carbolic and other odorous disinfectants in the cowshed; carefully follow instructions if chlorine compounds are used in the dairy. (White vaseline and boracic powder make a good ointment, which is non-tainting.)

Cardinal Points in Cream Production.

Healthy, well-fed stock.

Near-sterile utensils.

Abundant and pure water.

Milking clean udders in clean bails; using clean hands.

Cool cream as low as possible, and keep cool.

Frequent delivery of cream to the factory.

Consult the district dairy inspector, who will advise on any cream defect or on other points in dairy practice. Let QUALITY be every dairy farmer's watchword.

DAIRY HERDS DURING WARTIME.

War has placed a serious strain on many dairymen by depriving them of labour, which has naturally resulted in decreased production through compulsory reduction in size of herds, inability to grow supplementary crops and conserve fodder and other circumstances.

Where this reduction has occurred, or is about to occur because of absolute necessity, there is a big responsibility on the farmer to use much discretion in culling the herd.

Where systematic herd testing had previously been practised, little difficulty should be experienced, as the farmer knows the exact production figures of each cow. However, there is a risk in the possibility of "poor" cows, recently calved and in the flush of their production, being retained in the herd at the expense of cows which are very much better, but which at the time of culling, are further spent in their lactation, and are therefore rejected on their present value only.

Then, where there may be no certainty of an assured market after the war for milk from many Queensland districts previously supplying cream, but now supplying milk for Army purposes, there are at present indications that cattle are being bought haphazardly at auction sales and otherwise to increase dairy herds, merely for the sake of additional milk supplies. These cattle are often the culls from herds reduced because of wartime difficulties.

This practice may fulfil immediate requirements, but it is fraught with serious consequences, because it may mean the insidious introduction into a herd of a class of cow which, before the change-over to milk supply, would not even be considered. Where these unknown cows are introduced into the herd because of immediate necessity, care should be taken not to breed the future herd from them (unless, of course, they qualify by test as good cows); otherwise, in many cases, herds which have taken years to build up on sound butter-fat production lines, may, after the war, prove to have greatly deteriorated.

—C.R.T.

Food Scraps for Pigs.

E. J. SHELTON, Instructor in Pig Raising.

IN feeding kitchen scraps to pigs, it is essential to consider the animal's habits, and the conditions under which the food is made available to the animal; the risks attached to feeding food scraps; the necessity for thoroughly sorting and then boiling the whole of the refuse food, especially meat; and hygienic measures necessary for the control of disease—in other words, to render the feeding of garbage a reasonably safe, even if a somewhat doubtful, undertaking.

The Pig and Its Food.

The pig is both omnivorous—feeding on all classes of food—and carnivorous—feeding on flesh. For best results in feeding, however, the pig should be given a mixed diet, well balanced in food elements. Sufficient food should be given at regular intervals, and served from clean utensils and in a clean trough affixed to an impervious feeding floor kept continuously clean.

The pig is not necessarily a glutton, but has a very vigorous appetite in health and an inborn fear that if he does not "hop in" and get his share of the available food the other fellow will take it all. Thus it is that under ordinary conditions there is a willing "go" at the food trough when once the buckets rattle and the meal is on.

At a very early age the pig should be trained to help itself to foods other than its mother's milk, and a few scraps of bread or vegetable, a piece or two of cooked meat and a little salt (but only a very little), and charcoal with some clean drinking water will encourage the animal to go further afield each day for its food.

Feeding Risks.

Food scraps as here referred to consists principally of refuse food from military encampments, hotels, restaurants, markets, stores, and domestic quarters, but it is only good if fed under the best of conditions, especially in tropical climates, for it very soon deteriorates and may become rancid if the containers in which it is held are not kept strictly clean and the food delivered and used as soon as practicable after it becomes available.

It is possible for uncooked meat in camp refuse to become the medium through which the virus of swine fever may be conveyed. This disease is highly infectious and quickly fatal, and it may spread through a piggery with great rapidity. Fortunately, the dread scourge is not

communicable to human beings, but man, birds, dogs, rats, and other "carriers" may be the means of conveying infection in a variety of ways.

Many suburban pig farmers are extremely careless in the feeding of food scraps and swill and spill portion of the contents of the container around the yards, thereby helping in the breeding of myriads of flies and attracting animals and birds. There is far greater risk in the feeding of camp kitchen refuse, especially on small suburban holdings, than is the case with dairy or mixed farm piggeries where such food scraps are not usually fed. People who are careless in their pig feeding practices are often ignorant of the great risk to the industry in the feeding of uncooked garbage food. The pig industry is far too valuable, especially in war-time, for such risks to be run.

The boiling of all refuse food is now absolutely necessary under regulations recently gazetted. By boiling is meant complete boiling (and frequent stirring) for at least one hour of all refuse food, inclusive of vegetable matter, bread, meat, and swill.

If conveniences for boiling are not available immediate inquiries should be made at the Department of Agriculture and Stock, Brisbane, with a view to ascertaining where such equipment may be obtained.

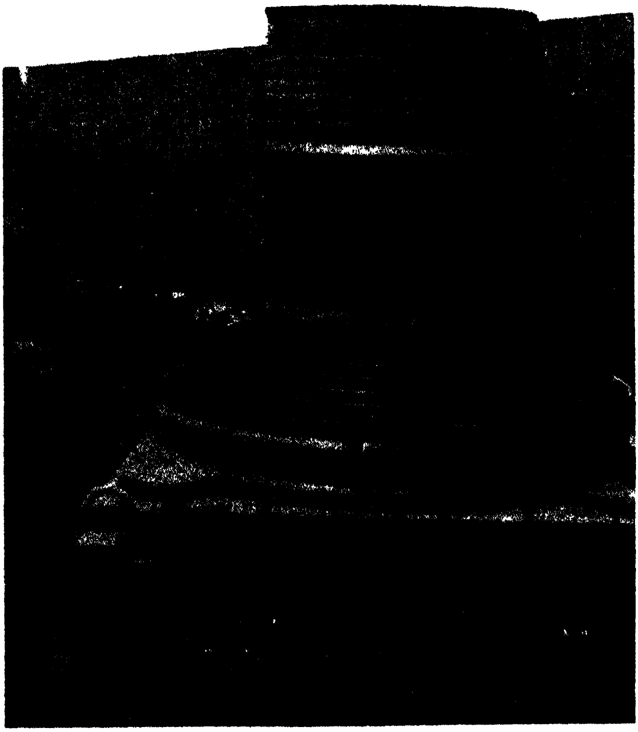


Plate 25.

Portable Water Fountain.—A dependable supply of cool drinking water is essential for pigs fed on kitchen scraps and similar foods, and a fountain like this is particularly useful where it is impracticable to pipe water to a piggery.

Collection of Camp Refuse.

Camp and restaurant refuse is usually bought and collected by pig feeders under contract. Contract buyers should strictly specify that the "pig tin" *must not* be used as a dump for soap suds, soda, ham or corned beef water, broken glass or bottles or other "foreign" material. Stale bread and vegetable matter should be stored in separate containers, and on the farm where it is fed there should be a rat-proof container, into which all extraneous materials should be placed for early disposal.

In the United States of America, in some cities, city garbage is processed and dried, resulting in the production of so-called "table scrap meal" or "garbage tankage." It is stated that the recovery of the fats in process of treatment enables the system to operate at a profit and with a greater measure of safety to the pig industry as a whole.

Suitable Scraps for Store Pigs.

Special care should be taken in the purchase of store pigs to be fed on food scraps or buttermilk, as these foods are normally quite unsuitable for very young weaners and slips. Weaning age is a very critical period in the life of a pig, and if there is any setback in growth at this stage—and there often is where pigs are weaned early and sent to saleyards—the animal rarely recovers normal growth; and if also at this stage there is a change-over to scrap food, serious bowel disorders may result. So only well-grown, strong stores, three months old or more, should be used for the consumption of camp kitchen refuse. Moreover, great care should be taken to protect the health of the pigs by isolating all new purchases until there is no longer a risk in their mixing with stock already on the farm.

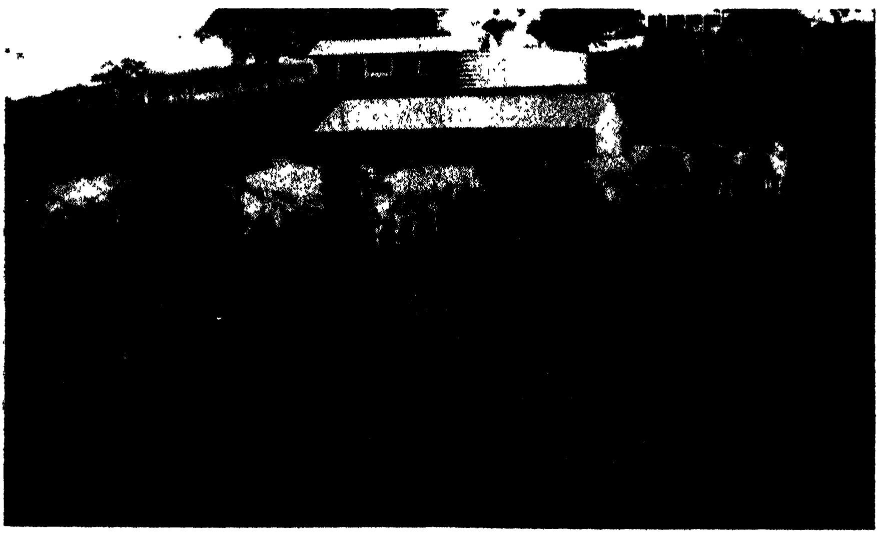


Plate 26.

PORTABLE SELF-FEEDER FOR PIGS AT THE "TOPPING-OFF" STAGE.—Camp kitchen refuse as a sole food is not a sufficiently balanced diet for pigs, hence some grain is a necessary addition. Grain is best fed in a dry, coarse meal form, and feeding is simplified by using a self-feeder such as is here illustrated.

Topping Up on Grain Essential.

While in the finishing stages of feeding it is necessary to avoid overfattening, it is equally necessary to allow the animals some grain food to "firm-up" the fat and put the animal into "prime" condition. Camp kitchen refuse varies so greatly in its composition, and is so often in variable supply, that it is a risky food, which is likely to be also deficient in mineral and vitamin content.

However, where "garbage-fed" pigs are efficiently topped up on grain, and some green food, there is no reason why the quality of the resultant pork should be low; in fact, normally, well fed "garbage-fed" pigs should realise satisfactory prices.

Cleanliness in all operations, feeding from clean impervious food troughs, affixed to impervious feeding floors, and the boiling of all scraps, regularity in feeding and the rule of "small feeds and frequent feeding" should always be the practice in "garbage" feeding piggeries.

Municipal Control.

In the larger cities and towns all "garbage" feeding piggeries must be licensed under the local authority, shire, or municipality. Particulars of the regulations may be obtained, free of cost, from the shire or town clerk, who also will supply the application form for license of suburban piggeries.

It is important that all containers and vehicles used in the cartage and feeding of camp kitchen scraps should be kept strictly clean. The garbage tins should be scoured out at the end of each day. The vehicle also should be well washed down.

At all premises where pigs are fed with cooked meat, offal, blood, or refuse the feeding floors must be constructed of concrete or other material impervious to moisture, and each feeding place, sty, or shelter must be kept in a clean and sanitary condition to the satisfaction of the Departmental Inspector.

Long-term Contracts Desirable.

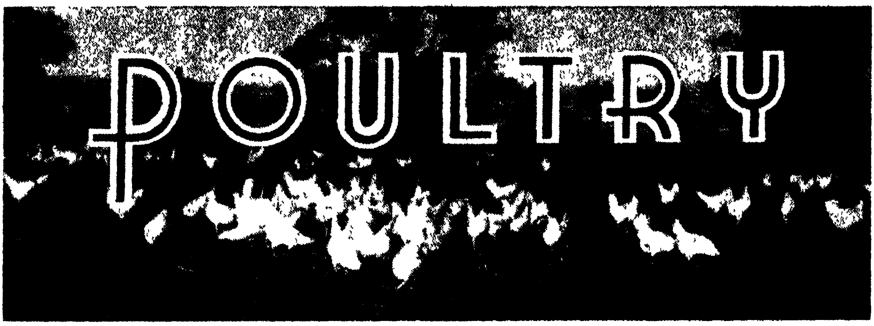
One of the disadvantages of garbage collection is that in many cases the contracts, often verbal, are of short and uncertain duration. Military contracts, however, have to be arranged in the usual official way—by tender—and are invariably of longer duration. In general, the term of a contract is largely influenced by the satisfaction given by the collector to the person or organisation supplying the food. The big advantage of a long-term contract is that the farmer is enabled to spend more money on the layout and equipment of his piggery and in the purchase of foundation stock.

CORRESPONDENCE COURSE IN PIG-RAISING.

The Department of Agriculture and Stock offers to persons interested in pig-raising, resident in Queensland, a free course of instruction by correspondence. This course comprises forty-eight lessons, one or more of which may be completed each week, according to the time available for study.

The lessons cover breeds, selection of stock, breeding, feeding, management, and marketing; plans of piggery equipment and notes on pig feeds are also included. There is also a section dealing with slaughtering and farm curing of bacon.

Farmers, persons employed on farms, or those interested in rearing pigs but not farming may enrol by forwarding a written application to the Under Secretary, Department of Agriculture and Stock, William Street, Brisbane.



The Feeding of Chickens.

P. RUMBALL, Poultry Expert.

CHICKENS grow rapidly in the early part of their life, especially during the first six to eight weeks. Consequently, rations with a relatively high protein content are necessary to ensure the best development. It has been established that rations having a crude protein content of 18 to 20 per cent. should be used during the first six to eight weeks, and after that period this should be reduced to 15 per cent. The protein requirement of a chicken does not alter as sharply as this, but the periods mentioned and the protein requirements of the chicken at this stage in its life are considered sound for all practical purposes.

Milk is considered the most desirable protein feed for chickens and growing stock, but because of its cost its exclusive use is not always practicable. Wherever possible, milk should form a portion of the ration. It may be given in the form of curds, semi-solid milk, buttermilk, or buttermilk powder. As a drink, milk is excellent, but it is objectionable because of the difficulty of keeping chickens clean. Buttermilk powder is favoured because of the ease with which the powder may be incorporated in the mash, thereby controlling the kind of food that each chicken consumes. Apart from its concentration, however, it has no definite advantage from a feeding value point of view. Proteins build flesh, but at the same time a bony framework is necessary. Examination of the chicken at different ages indicates that it is particularly important to allow for the mineral requirements from the eleventh to the twenty-fourth week. In all experiments conducted by the Department of Agriculture and stock, provision has been made for increased mineral intake by the addition of bonemeal to the mash at eight weeks of age, and by allowing the birds free access to grit (shell and hard).

The table showing the food consumption of chickens (see page 113) has been compiled as a result of actual experiments conducted at Yeerongpilly.

The variation in weight from week to week and the ever-increasing amount of food required suggest the undesirability of laying down hard and fast rules as to what quantity should be supplied.

The food requirements increase week by week and a system of feeding which enables the growing birds to consume all they need is the most desirable.

FOOD CONSUMPTION OF CHICKENS.

Age.	Leghorns.		Australorps.	
	Weight of Chickens.	Food Consumed Weekly.	Weight of Chickens.	Food Consumed Weekly.
	Oz.	Oz.	Oz.	Oz.
Day old	1·3	..	1·36	..
1 week	1·97	1·64	2·14	1·53
2 weeks	3·31	3·36	3·61	3·32
3 weeks	5·31	4·80	5·84	5·05
4 weeks	7·61	6·46	8·68	7·20
5 weeks	9·94	7·58	12·08	6·89
6 weeks	12·92	8·96	15·86	10·62
7 weeks	16·65	8·65	20·17	13·95
8 weeks	20·41	13·29	25·31	15·05

By reason of the fact that the kind of food consumed is easily controlled, and that it is always in front of the birds, the all-mash system of feeding chickens is suggested as being the most desirable. All-mash should be placed in shallow trays about 1 inch in depth during the first few days. Trays of a depth of 2 inches should then be used, and by the end of the first week narrow trays or troughs 4 inches deep should replace these. At this age chickens will commence to scratch with more vigour, scattering the feed from the trough. This can be prevented by placing a piece of netting on top of the mash loose enough to sink with the mash as it is gradually consumed. During the first week, 8 lineal or running feet of feeding space should be allowed for every 100 chickens, and increased later to 12 feet. Before the mash is covered with netting, it is important that only a little food at frequent intervals be placed in the trays so as to avoid wastage. In fact, the frequent feeding of all-mash appears to induce greater food consumption and better development.

Breeders who do not desire to feed an all-mash may make use of commercial chick grains and growing mashes, which may be fed as directed by the manufacturers. It has been the custom for many poultry raisers to use scratch grain only for a short period of a chicken's life, but in view of the more satisfactory results obtained by feeding a ration of a relatively higher protein content than is usually contained in chick mixtures, early mash feeding seems essential.

Chickens from about two weeks old may be reared satisfactorily on moistened mashes and grain but the mashes should be fed at frequent intervals. This system has the advantage of using milk, when available, to moisten the mash. The feeding of dry mash, however, is suggested as a safer method, as the possibility of food becoming sour and the probable consequent bowel trouble among chickens is avoided.

ALL-MASH RATION.

——	1 to 8 Weeks.
	Per cent.
Maize meal	40
Bran	20
Pollard	20
Meat and bone meal (63 per cent. protein)	7½
Dried buttermilk powder	10½
Salt	1
Cod liver oil	1

The mash set out above has been used successfully in many experiments conducted by the Department of Agriculture and Stock in feeding chickens to the age of eight weeks. At the present time it may not be

practicable to adhere strictly to this ration because of the cost of some of the ingredients, but in view of the small amount of food consumed by the chicken early in life and the benefits that follow a good start in life, the additional outlay is justified.

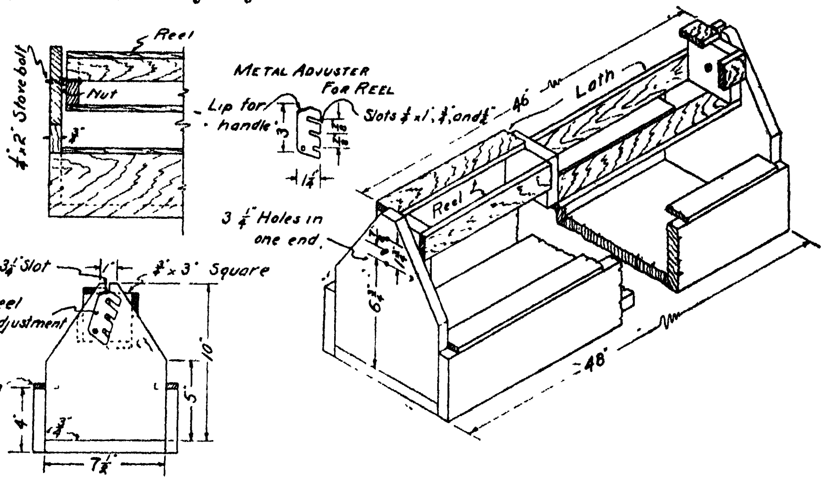


Plate 27.

Details for making intermediate sized chick hopper with revolving reel for chicks over five weeks of age.

It will be noted that cod liver oil has been used in the all-mash ration. This is not obtainable to-day. Its use was necessary to supply vitamin D, and to some extent vitamin A. There is sufficient vitamin A in the maizemeal if yellow maize is used, and the lack of vitamin D can be overcome by allowing the chickens to have constant access to sunlight.

Because of the cost of maize, there will be a tendency to cut down on the quantity incorporated in chicken mixtures. This should not be done if at all avoidable, but if it is done a good supply of succulent green feed should be available.

Green feed may be fed to chickens when only a few days old. The tearing up of some succulent greens—such as lettuce and Chinese cabbage—is suggested, and when the chickens take to green feed in that form the whole head can be placed in the run and the chickens will tear it up as required. This method of feeding green feed provides occupation, and so assists in curbing vices.

When eight weeks old chickens need a different ration. Some breeders alter it at six weeks. Many just change from an all-mash starting mixture to a laying mash and grain, allowing the birds to largely balance their own requirements. When this practice is followed, chickens should be given all the grain they will eat.

Laying mashes do not contain the maize meal that starting mashes have. Therefore, in the change-over the vitamin A content of the ration will be reduced below the level essential for health and development. This difficulty at the present time may only be overcome by feeding an abundance of green feed. If ordinary green feed is unavailable, some of the best-quality lucerne chaff obtainable may be used as a substitute. The quality of the chaff should be judged by its green colour and the amount of leaf it carries. Greater consumption of lucerne may be stimulated by soaking it in the quantity of water which it will absorb in 12 to 24 hours.

ANIMAL HEALTH

Pneumonia of Swine.

G. R. BRETTINGHAM-MOORE, Veterinary Officer.

PNEUMONIA is of common occurrence in Queensland and, in general, is of two types, parasitic and infectious.

As the parasitic type is adequately described in the departmental bulletin "Parasites of the Pig," only the infectious type will be dealt with here. It may occur without any apparent source of infection being noticeable, but is usually associated with unsatisfactory conditions of management, whether of diet or accommodation.

Symptoms.—Lack of appetite, high temperature and, perhaps, nervous symptoms and a staggering gait. Breathing rapid and difficult, accompanied by coughing, accounts for the common name of "pants." There may be discharges from eyes and nose.

Deaths may occur in twenty-four hours or the sickness may last for a week or two. Some pigs recover wholly or partially. Lameness and swollen joints may occur, and red blotches may be seen on the skin.

Treatment.—Sick pigs should be isolated. If they do not improve in a few days, slaughtering and burning are advisable, for if they recover after a severe attack, they may become "carriers," providing a constant source of re-infection.

Diagnosis.—This type of pneumonia may be, to some extent, differentiated from the parasitic type, as in the infectious type not all pigs are affected, but a substantial percentage die, whereas in the parasitic type nearly all are affected, but deaths are few.

Post Mortem.—The principal changes are seen in the lungs. There is a considerable amount of fluid in the chest cavity, and patches of the lung tissue are dark red and solid, not having the elasticity which characterises the healthy organ, but feeling like a piece of liver.

The surface of the lungs may adhere in parts to the chest wall, and in old-established cases the solid areas are often greyish and dotted with small yellow spots. In addition, one or more small abscesses may be present.

Prevention.—Prevention is obviously of first importance, and the routine isolation of all sick and unthrifty pigs immediately their condition is noticed is the first step in successful control. For the rest, close attention to the principles of housing and general hygiene will do much to prevent outbreaks and limit their severity when they do occur. All contaminated yards and pens should be spelled for a couple of months.

LANTANA POISONING IN CATTLE.

In winter, when green feed is short, lantana poisoning may occur. As a rule, the history of lantana poisoning is one of cattle moved to a new run. Their condition falls away rapidly, and, if in milk, the supply dries up. The muzzle is dry and covered with scabs and may become quite raw. Hence the name pink nose. Mucus streams from nose and eyes, which later become deeply sunken. The appetite is impaired or absent. Certain parts of the body, especially the udder, become very itchy and later covered with scabs. Large areas on the thighs and buttocks, and, in fact, almost anywhere on the body, may become raw from rubbing against trees and posts, consequent on the intense itching.

Death is often the sequel and recovery, if it occurs, is slow and may be incomplete. No satisfactory treatment is known, but a drench containing 2 teaspoonfuls of potassium permanganate, 1 lb. magnesium sulphate, ¼ lb. molasses in 1 quart of water, has been suggested, and might be tried for want of something better.

In addition, shade and protection from the weather should be provided and ample green feed and water given. The raw areas should be covered with Stockholm tar to allay the irritation.

Children should be warned against eating the berries of the lantana, as cases of poisoning have been reported.

—G.R.B.-M.

MILKING COWS BEFORE CALVING.

The practice of milking cows before calving is a bad one. Pressure within the udder giving it a distended appearance is not harmful, although the cow may look uncomfortable. The chief reasons for not milking cows before they calve are:—

1. Colostrum, or beastings, is taken away, and so is not available to the newly-born calf.
2. Quarters milked often become pendulous or baggy after calving.
3. Milking before calving is especially bad for heifers, because, with the stimulation of the milk secretion, the growth of udder tissue stops;

Milking before calving does not make a cow more susceptible to milk fever; on the other hand, it is sometimes done to assist in the prevention of milk fever.

Agricultural Chemistry

Lime Supplements for Stock.

J. L. FORAN.

ANALYSIS of grains show, in general, good protein content, and while the *quality* of the protein is better in some than others, for practical purposes sufficient protein is obtained from the feeding of grain. The mineral contents of grains show fair amounts of phosphorus, but are exceedingly low in calcium.

Corn (maize) contains ·01 per cent., wheat ·03 per cent., oats ·09 per cent. Sorghums are about the order of wheat. Legume roughage and hay have good to very fair amounts of calcium. Even on soils containing little calcium relatively fair amounts of this mineral are contained in these roughages.

Farm animals are prone to suffer from the lack of sufficient phosphorus and calcium. Seeing that these two elements constitute about three-fourths of the mineral content of the whole body, and more than half the mineral content of milk, it is obvious that when feeding grain sorghum, which contains fair amounts of phosphorus, the addition of a calcium supplement is necessary.

This is even more important when grain sorghum forms a large proportion of the ration.

Though bone meal, a compound of calcium and phosphorus, may be used, it is cheaper to feed other forms of lime and to reserve bone for conditions where both calcium and phosphorus are deficient.

The following list indicates the value of the various lime supplements—

(1) Ground limestone, the best quality of which contains up to 38·5 per cent. of calcium.

(2) Dolomitic limestone, which contains magnesium carbonate, is fairly satisfactory.

(3) Ground shells, very similar to ground limestone.

(4) Marl, satisfactory if the clay and sand content is not too high.

(5) Wood ashes, containing about two-thirds the amount of calcium in ground limestone.

(6) Gypsum supplies calcium in the form of sulphate instead of carbonate, and has been found satisfactory.

Unslacked or water slaked lime should not be used on account of their caustic nature.

The above supplements, if not incorporated in the ration, may be supplied as a lick by mixing two parts of finely ground limestone or its equivalent to one part of salt.

Cyanogenetic Plants.

W. R. WINKS.

QUEENSLAND has a number of plants which contain prussic acid, and which constitute a potential danger to our livestock. In normal seasons the quantity of these plants eaten by stock is so small that deaths from them are rare. Shortage of green feed, however, brings them into greater demand by our livestock, especially as some of them are more resistant to frost damage than the grasses which constitute our natural pastures.

These cyanogenetic plants (i.e., plants which contain prussic acid) occur both in and out of cultivation. Feeding tests in various parts of the world indicate that plants containing twenty milligrams of prussic acid per 100 grammes of green plant are dangerous to stock, and it is with plants which fall into this category that the writer proposes to deal in this note.

Sorghums.—It is a well-known fact that most sorghums contain prussic acid when young, but such care is generally taken in the feeding of them that the presence of this poison has not been allowed to detract in any way from the high esteem in which they are held as fodder plants. Cases, however, have come under the notice of this Department where farmers have found ratoon sorghum growths 6 to 12 inches high showing signs of frost damage, and rather than lose this green feed have turned cows into it with fatal results.

The Wild Sorghum (*Sorghum verticilliflorum*) and Johnson grass are cyanogenetic over their whole life period, and constitute special danger during autumn and winter when other feed is scarce.

Couch Grass.—Several of our couch grasses are cyanogenetic, and have been known to cause quite severe losses among hungry stock.

Shrubs.—Two shrubs which contain particularly large amounts of prussic acid in their leaves are the Wild Plum (*Ximenia Americana*) and the Wild Fuchsia (*Eremophila maculata*), both of which are eaten to some extent by stock.

It is a peculiar fact that some stock can become accustomed to these cyanogenetic plants and eat them with impunity, while other stock newly introduced to them soon die.

SOIL AND WATER.

How many people watering the garden with a hose dig down to see how far the water has penetrated into the soil? To water efficiently it is necssary to soak the soil to 10 or 12 inches. Most of the plant roots go down to 12 inches—some penetrate deeper. The top 2 inches of soil is mostly kept loose through digging out weeds and grass and keeping the surface worked with the idea of preventing evaporation. It can be seen from this that watering to 4 inches deep is not very beneficial to the plants, and is not economical watering. Water evaporates quickly from the surface of the soil, and unless the water is sufficient to give the soil a good wetting the practice of sprinkling the surface is wasteful, as it is only applying water which is quickly lost into the air and the roots of the plants are in dry soil.

—F.K.

Marketing

Supply of Fruit and Vegetable Cases.

J. W. GARSDEN, Marketing Branch.

THE difficulty of obtaining enough cases for the marketing of fruit and vegetables is becoming more acute, and it may soon be necessary to consider whether efforts to provide sufficient timber and nails for new cases and to recover used cases should not be supplemented by other measures. The timber industry is being asked to meet an enormously increased demand for cases and crates of all kinds, as well as for building timber. Notwithstanding the substitution of plywood for ordinary sawn timber in the making of cases, such as butter and munition boxes, considerable difficulty in meeting requirements is being experienced.

The possibility of a case shortage was foreseen by the Government at the beginning of the war and early action was taken to ensure the conservation of used cases for fruit and vegetables. An appropriate authority was set up to administer "*The Second-hand Fruit Cases Act of* 1940," which in the controlled area prohibits the use of second-hand fruit cases for any purpose other than as containers for fruit and vegetables, and provides for trading-in used cases only through dealers licensed by the committee of control. This committee has succeeded in conserving considerable numbers of cases which would otherwise be lost to the industry, and in recent months case sales to growers by licensed dealers have approximated 100,000 a month.

The Department of Agriculture and Stock has kept in contact with the timber authorities regarding case supplies, and with the co-operation of the several interests concerned, including the principal case distributors, has so far been able to avert a serious shortage of supply during harvest periods.

There are, however, certain factors affecting an adequate supply of cases for future requirements, which are now beginning to claim attention. Firstly, there is the loss of cases conveying fruit to interstate markets and to combat areas. This loss is only partly offset by cases containing fruit brought into Queensland. Then there is the expansion of production of cased lines in preference to vegetables not usually marketed in cases; for example, the relatively high increase in tomato-growing as compared with, say, cabbages, and, finally, the increasing use of cases for the marketing of bananas, beans, and lettuce, and other produce which until comparatively recent years were marketed by the bunch or bag.

How, and to what extent, control measures should and could be taken respecting these factors are points which have already been

tentatively raised. To date, efforts to meet case requirements have been concentrated in the direction of increasing supplies, but no action has been taken to regulate demand.

There are, undoubtedly, a number of considerations which make it undesirable that there should be any restriction of the free choice of markets or of the kind of crops grown. No one will question the advantage or the desirability of using cases for marketing such crops as lettuce; but, conditions being as they are, the question arises can the industry afford to risk a serious breakdown of supplies if it can be avoided by an adjustment of its own demands

PIGMEAT REQUIREMENTS.

As from 9th August, 1943, the slaughtering of porker pigs of less than 100 lb. carcase weight will be prohibited. In addition, the sale in shops of pork from carcases of less than 100 lb. carcase weight will be forbidden.

In recent months there has been a sharp and substantial increase in pigmeat requirements, an increase that arises from the large demands of the fighting services and also from Britain's request for larger quantities of pigmeats. These demands call for a decided concentration on the production of heavy weight baconers, which is the most effective immediate method of increasing pigmeat output.

Under *The Pigmeat Acquisition Plan*, all pigs of more than 100 lb. dressed weight, which have been slaughtered in registered establishments, are acquired by the Commonwealth Government. The plan does not provide, however, for the acquisition of lighter pigs, the price of which has hitherto been controlled indirectly by means of a wholesale ceiling. In an effort to encourage the maximum production of baconers, and to discourage the sale of pigs as porkers, the wholesale ceiling for pork was lowered to a price equivalent to 6d. per lb. to the producer, but more rigid control has become necessary. There is a grave risk of pig-raisers concentrating on the production of light-weight pigs with disastrous results, so far as service and export supplies are concerned.

These restrictions will not necessarily result in the removal of all fresh pork from the local market. The Services must, of course, have first call on pigmeat supplies, but a proportion of the carcases between 100 lb. and 120 lb. weight should be available for civilian consumption as fresh pork.

A restriction on the slaughter of light-weight pigs operates in New Zealand.

Pig-raisers are appealed to to carry on every pig to heavier weights, and where suitable up to a weight not exceeding 180 lb. dressed, which is equivalent to live-weight of 240 lb., the maximum of the weight range prescribed for baconer pigs. There will be a proportion of pigs which cannot be carried to the maximum weight without excessive fat. Those pigs will need to be slaughtered at less than 180 lb., but every pig which can be carried on should be carried on. Pork has become a luxury; bacon, and especially heavy-weight bacon, is a vital wartime foodstuff.

General Notes

Sugar Levy.

Regulations approved under *The Primary Producers' Organisation and Marketing Acts* empower the Maryborough mill suppliers' committee to make a further general levy for administrative purposes on suppliers of sugar-cane to the Maryborough mill at the rate of one halfpenny per ton. A levy of one halfpenny was approved earlier in the sugar season.

Staff Changes and Appointments.

Mr. J. J. Shelvey, Inspector of Stock, has been transferred from Warwick to Dalby.

THE QUEENSLAND AGRICULTURAL JOURNAL.

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts in Queensland on **prepayment of One Shilling.** Members of Agricultural and kindred Societies **Five Shillings, in Queensland** post free. Others **Ten Shillings,** post free.

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Postal Address ....

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For the enclosed .... *please forward me the "Queensland Agricultural Journal" for* .... *years.*

My main source of Income is from..

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NOTE.—Subscribers who wish to obtain the Journal for the month when the subscription is sent, must apply before the tenth of that month.

Rural Topics

Horse Training.

A kindly temperament is probably the most desirable quality in the horse trainer. In the training and education of horses several natural difficulties have to be contended with. In the first place the horse is much more powerful than man, and just so far as it learns that it can resist man's control will it gain courage and be inclined to combat the trainer. The horse, during the early part of its training, should, therefore, be treated so that, however wild or apparently unmanageable it may appear, successful resistance is impossible, while, at the same time, everything possible is done to enable the animal to do what is required by the trainer. If this practice is adopted the animal learns that it will not be injured by the trainer, and it is found that the horse will generally submit to training and do anything for which it is by nature adapted.

A horse's methods of understanding are entirely dependent on the experience of its senses of seeing, hearing, smelling, and feeling. To prevent it becoming excited or frightened of objects and sounds with which it is necessarily brought in contact, the animal must be convinced, through these faculties, of the harmless and innocent character of those objects and sounds. The horse, being unable to understand the meaning of articulated language, except in so far as words are associated with actions, must be addressed on its own plane of understanding, because it is only by doing so that man can expect the animal to comprehend his wishes clearly.

The horse, however, has a very retentive memory, which should be made full use of, particularly in the early stages of the animal's education, by freely using methods of suggestion. The police horses which head every public procession in Brisbane are outstanding examples of good horse training.

Flies Spread Mastitis.

At the Florida Agricultural Experiment Station (United States of America), cows shown to be free from all traces of mastitis were placed in a screened, isolated building. Flies were kept to a screened cage and allowed to feed freely on milk from the quarters of mastitis-infected cows. Through use of a special "fly-holder" the insects were then permitted to contact the teat openings of the healthy cows. The disease was readily transmitted by this method.

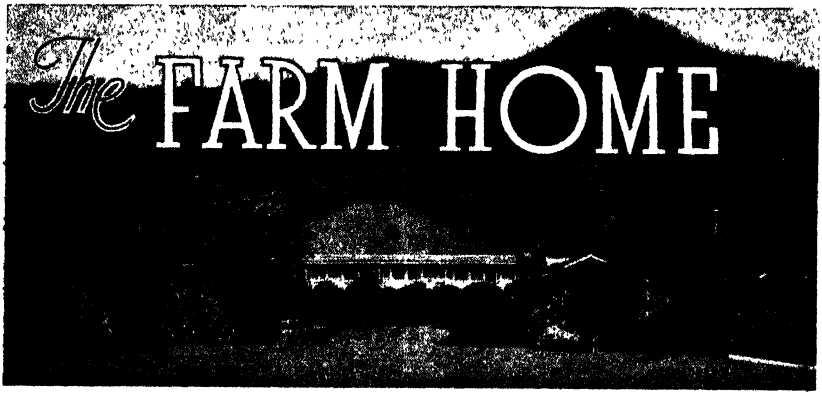
Too many good farmers err in thinking of mastitis as an individual cow problem rather than as a herd disease.

In reality, there are two distinct forms or types—namely, acute and chronic cases. Acute cases show fever, loss of appetite, warmth, hardness, and discolouration of one or more quarters and, all too often, death from septicemia or blood-poisoning. But the chronic cases, though less spectacular, are the dairy farmers' real enemy. The causative germs, usually streptococci, may lie dormant in the deeper parts of the udder for weeks or months. Damage is so gradual that owners note scarcely any external evidence of the trouble. However, little by little, "udder trouble" spreads to other cows in the herd and milk profits decrease. To all this is added a public health problem, for some types of "streps" from diseased udders may cause septic sore throats in people.

Of course, flies are not the only means of spreading mastitis. Contaminated milking machines, careless wet-hand milking, stripping infected quarters on the floor, and so on, may be responsible.

Another Way of Using Whey.

Here is still another way of using whey:—The Bureau of Dairy Industry in the United States has announced the perfection of a process by which a new transparent rubber-like plastic can be made from the lactic acid of whey. This new substance is said to have many valuable industrial uses. Plainly, whey is increasing in importance as a valuable by-product of the dairy industry.



Maternal and Child Welfare.

Under this heading is issued each month an article, supplied by the Department of Health and Home Affairs Maternal and Child Welfare Service, dealing with the welfare and care of mother and child.

BABY'S HEALTH—NATION'S WEALTH.

THE MAGIC OF TOYS (2).

TOYS and other play materials are so very important in the life of the child, because, properly chosen and used, they can educate him as well as amuse him, thus aiding in his mental and social as well as physical development. Providing suitable toys in war time presents a difficulty to many parents, because of their scarcity as well as their high price, but useful and interesting toys may be made out of cigar boxes, clothes pegs, cotton reels, boxes and tins of all sizes, some three-ply, a broom handle, and perhaps a pine packing case. With these materials and some bright-coloured paints, cotton waste and scraps from a sewing bag there are the requirements of a promising toy factory all ready to commence work.

Regarding paints, it is important that they do not come off easily or contain lead. Any reliable firm will advise on these matters if it is explained what the paints are for.

From three to eighteen months, a baby needs toys which appeal only to three senses—sight, hearing, and touch. Tins or boxes containing small stones or buttons can be fashioned into rattles with a little ingenuity and a flat coffee or cake tin can be made into a drum with holes punched through the middle of lid and bottom of tin, edges smoothed, and a strong string passed through and tied with a firm knot. Clothes pegs may be used for drumsticks. Rubber toys are unprocurable, but toys made from scraps and firmly stuffed with cotton waste are easily made. Most large stores supplying dress materials have patterns for these toys with full directions for making.

A home-made rocker gives as much fun as the more expensive variety and can be made with an ordinary pine box, provided it is large enough for the child to sit in comfortably. The bottom of the box should be fitted with curved runners. Painted in bright colours with a small border it can look very attractive.

Hobby horses can be made of pieces of broom handles with a cut-out horse's head attached. A push cart needs specially prepared timber, but is quite simply made.

All children like trains, which can be made with blocks of wood about 6 inches long for cars joined together by cup hooks and rings. A 3-inch length of broom handle makes a good boiler for the engine with a cotton reel for a funnel. Wheels are not necessary especially for very small children, but, if required, can be made of 1 inch dowelling or broom handle fastened to the cars with split pins.

Cotton reels painted in different bright colours can be used as beads and threaded on to a strong shoe lace. A colour stand, besides providing amusement, will teach a child form, colour, and number without any conscious effort on his part. This can be made of a rectangular piece of wood in which are set three uprights of heavy gauge wire. Groups of six or more cubes each drilled with a hole are placed on the wire; one group coloured blue, one yellow, and one red. At first a child will mix the colours in taking them on and off, but he soon learns to put them in their right groups. Cotton reels may be used instead of wooden cubes.

Insets, made from three-ply, teach concentration—a most important attribute. Clothes pegs may be scarce at present, but if obtainable the tiny tot will play happily putting them on and taking them off the edge of a tin. Duco or paint both pegs and tin in bright colours. Blackboards are easily made with three-ply inked over with a blackboard preparation, and children may spend fascinating hours on wet days with a box of coloured chalks. Drawing teaches hand and arm control and concentration.

Children like using a hammer and nails and a carpenter's bench made in the shape of a cross with a box of nails fixed in the centre will keep several kiddies happy for a long time. The little carpenters stand at each end and hammer nails into pieces of soft wood to their heart's content. There is no danger of their hitting each other, and since they naturally hold the hammer near the head they do not raise it very high and so small fingers are fairly safe.

A slide is another thing of which toddlers are very fond, and since it encourages them to climb and is quite safe, it is excellent to set one up in the back yard. A plank 4 feet long by 1 foot wide made with a firm catch at top and bottom, the top catch hooking over a carpenter's horse is all that is required. The children can crawl up the horse and slide down or up the slide and slide down, whichever they fancy.

Tinkler toys of cotton reels and discarded silk stockings, doll's furniture made with cigar boxes and clothes pegs, a hammering board with a box and pieces of broom handle are just a few more of the home-made articles which with bright-coloured paints can bring the magic of toys to the children's Christmases and birthdays, even in war time. Any further particulars on this subject or any other concerning Maternal and Child Welfare may be obtained by communicating personally with *The Maternal and Child Welfare Information Bureau*, 184 *St. Paul's terrace, Brisbane*, or by addressing letters *Baby Clinic, Brisbane*. These letters need not be stamped.

IN THE FARM KITCHEN.

The Makings of a Square Meal.

Potato Soup.—Peel and cut up potatoes allowing one for each member of the family. Cover with water, boil to a mash and rub through a sieve; add pepper, salt, butter and marmite to taste. Return to fire, heat but do not boil, and serve with squares of fried bread or toast.

Green Pea Soup.—½lb. dried green peas, 2 large onions, sprig of mint, 2 quarts of water, a little fresh milk. Soak the peas in cold water for 24 hours. Wash thoroughly and put them on to boil with the 2 quarts of water, 1oz. butter or dripping, or rinds or fat ends of bacon, and a small pinch of carbonate of soda. When boiling, add the cut-up onions, boil for 1 to 1½ hours; strain and rub the peas through the sieve; add pepper, salt and milk; return to the fire, warm up again but do not boil. Serve with fried squares of bread or toast; serve hot.

Red Pottage.—½lb. haricot beans, ½lb. tomatoes, 1 large beetroot, pepper and salt, 1oz. butter or dripping, 2 large onions, piece of celery or parsnip, 2 quarts water. Soak the beans in cold water for twenty-four hours and put them on to boil with the 2 quarts of water and butter. When the soup comes to the boil, add the tomatoes, the bit of celery or parsnip (can be left out if not in season), and the onions all cut in small pieces, and the beetroot peeled and sliced thinly. Allow to boil for two to two and a half hours, strain, rubbing the beans, etc., through a sieve, strainer or colander, add pepper and salt to taste. Warm the soup up and serve with fried squares of bread or dry toast. This is an excellent variety of soup, and is very nourishing, especially for children.

Tripe and Onions.—1lb. tripe, 2 onions, 1 pint milk, 1 teaspoon butter, 2 tablespoons flour, 1 dessertspoon chopped parsley, pepper, salt. Remove fat from tripe, cut meat into pieces 2 inches square. Put tripe into saucepan, cover with cold water, bring to the boil, then pour water off (blanching). Cover with fresh water, add salt and onions, cook gently till tender (about two hours). Pour off water, cut onions up finely and add milk, and bring to boil. Blend flour with cold milk, add to tripe, stir over fire until it boils and thickens. Cook for a few minutes, add parsley and cayenne pepper. Serve on hot dish; garnish with triangles of dry toast.

Pot Roast of Topside Steak for Large Family.—Ask the butcher to cut the meat in one thick piece. Heat a little fat in a strong unlined saucepan, and brown the meat quickly all over. Turn with two spoons so that each side may be well browned. Cut up two or three onions and place them beside the meat. Cover with a tight-fitting lid, and cook gently three or four hours. Every half hour put into the saucepan, one or two tablespoons of boiling water or stock. Lift the meat on to a hot dish, place the onions round, and serve the unthickened gravy separately.

This dish may be varied by cutting a pocket in the meat and stuffing with forcemeat or cooked rice, flavoured with nutmeg and chopped onion.

Steak or Kidney Pie or Pudding.—1lb. of skirt, chuck or bladebone steak and 2 sheep's kidneys or ½ an ox kidney, 1 small onion, 1 tablespoon flour, salt, pepper, stock or water, suet paste or simple pastry about ½lb. flour. Cut steak and kidneys into dice, remove fat, slice onion finely. Roll the meat in flour and seasoning. Steam the meat in a basin or simmer gently in a saucepan till tender, 2½ to 3 hours. If a pie is to be made, put in a pie dish and cover with a simple pastry. Bake 20 minutes in hot oven. If a pudding, put meat into a basin and place the suet paste on top. Steam in a large saucepan for 1½ to 2 hours with the lid tightly closed.

Plain Steam Pudding and Treacle.—2 heaped tablespoons of dripping, 1 teaspoon soda, 1 pinch salt, 2 cups flour, cerevite or fine wholemeal, 2 teaspoons of cream of tartar, 1 cup of water. Sift the dry ingredients together, rub dripping well into flour, till it is crumbly; mix with water to a firm dough. Put into a greased basin; cover lightly with butter paper, and steam for two hours. Serve with treacle or golden syrup. Children like this pudding.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Ayrshire Cattle Society, production records for which were compiled during the month of June, 1943 (273 days unless otherwise stated.)

Name.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORN			
	SENIOR, 3 YEARS (STANDARD 290 LB.).			
Mountain Camp Rosette 5th	W. Caldwell, Bell	7,091 04	316·186	Trevor Hill Reflection
	SENIOR, 2 YEARS (STANDARD 250 LB.).			
Cedar Grove Ellen 9th	J Crookey, Allora	7,033·5	270 67	Cedar Grove Monarch
Trevor Hill Greta 2nd	A. B. Wilson, Harlaxton	6,872 0	259 411	Sunnyview Royal
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
Ardilea Broady 8th	W. Hinricksen, Clifton	6,905·0	316·896	Newstead Reliance
Edendell Lovely	R. Manderson, Gleneagle	6.690·1	259·586	Edendell Prince
Glen Idol Primrose 6th (249 days)	P. Doherty. Gympie	6.024·1	240 88	Blackland's Count
	JERSEY.			
	MATURE COW (STANDARD 350 LB.)			
Trecarne Rosella 8th	T. Petherick, Lockyer	7,043 6	452 656	Trinity Some Officer
Trecarne Jersey Queen 3rd	T. Petherick, Lockyer	6.273·5	383·539	Trinity Some Officer
Larette of Calton	W. Bishop, Kenmore	7,739 35	381·505	Adrian of Calton
Lermont Duchess	J. Schull, Oakey	6,832·2	373·638	Woodside Golden Volunteer
Trecarne Graceful	T. Petherick, Lockyer	5,842 35	352 289	Trinity Some Officer
	JUNIOR, 4 YEARS (STANDARD 310 LB.).			
Lermont Claribell	J. Schull, Oakey	6,223 05	343·053	Woodside Golden Volunteer
	SENIOR, 3 YEARS (STANDARD 290 LB.).			
Glenview Glorious	F. P. Fowler and Sons, Coalstoun Lakes	6,133·98	319 203	Trinity Governor's Hope

	JUNIOR, 3 YEARS (STANDARD 270 LB.).			
Trecarne Eileen 8th	T. Petherick, Lockyer	6,379·3	350·276	Jerseylea Golden Duke
Trecarne Dairymaid 4th	T. Petherick, Lockyer	5,375·6	324·467	Jerseylea Golden Duke
Glenview Pilgrim Duchess	F. P. Fowler and Sons, Coalstoun Lakes	4,761·52	271·672	Woodside Renown 2nd
	SENIOR, 2 YEARS (STANDARD 250 LB.).			
Trecarne Attractive	T. Petherick, Lockyer	6,080·6	378·072	Jerseylea Golden Duke
Gem Cynthia	W. Bishop, Kenmore	5,944·3	313·863	Calton Lothean
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
Strathdean Duchess 2nd	S. H. Caldwell, Bell	7,232·42	374·973	Strathdean Dahlia Lad
Lermont Lockette	J. Schull, Oakey	5,533·7	310·491	Woodside Golden Volunteer
Glenview Vanity	F. P. Fowler and Sons, Coalstoun Lakes	4,909·0	281·244	Trinity Governor's Hope
Glenview Rosina	F. P. Fowler and Sons, Coalstoun Lakes	5,238·71	263·836	Trinity Governor's Hope
	AYRSHIRE.			
	MATURE COW (STANDARD 350 LB.).			
Leafmore Lady Laurel	J. P. Ruhle, Motley	6,717·5	358·54	Leafmore Colin
Leafmore Joybna Ralston	J. P. Ruhle, Motley	7,824·5	354·225	Leafmore Clarry
	JUNIOR, 3 YEARS (STANDARD 270 LB.).			
Elersley Angeline	St. Christopher's Stud, Brookfield	8,241·8	307·776	Benbecula Banker
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
Leafmore Billie Burke	J. P. Ruhle, Motley	6,250·25	283·592	Myola Jellicoe
Leafmore Phyllis	J. P. Ruhle, Motley	5,844·55	277·115	Leafmore Bonnie Boy

GADGETS AND WRINKLES

BUILDING WITH BAGS.

AT the present time, building materials are hard to get and farmers have to make use of whatever materials are available. The poultry farmer, particularly, with production expanding, is often faced with the necessity for extensions or additions to his fowl houses and storage sheds.

A fowl house or shed can be built cheaply with timber and cement-washed bags. Admittedly, even sacks may be scarce, but there are usually some available—fertilizer bags, for instance—which may no longer be usable for their original purpose, yet quite good enough for the job. If sawn timber for the frame is unavailable, bush timber may be substituted.

Here are the specifications for a cheap bag building:—

The principle of the structure is the substitution of bags for boards, the bags to be weatherproofed with a cement wash. In practice, so long as the sacks are not rotten, their condition does not matter. Holes can be roughly darned or patched and are completely covered when the job is done.

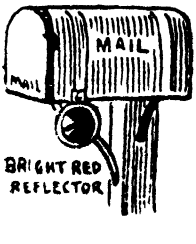
The frame of the building is made in the usual way with posts and scantling, and the most convenient distance to set them is about two feet, but if the sacks to be used are of one size the posts should be fixed to suit them. Thus, if they are 4 feet deep, 2 feet apart will be right, one sack covering two spaces.

Open the sacks out at the seams, make the edges level and nail securely to the posts, stretching as tightly as possible. Thin nails driven in two-thirds of their length and clinched on the upper third do the work well. When the frame has been covered, the following materials are prepared:—Cement 12lb, lime 2lb, salt 1lb, powdered alum ½lb, water about 6 quarts.

Mix the lime and salt and sift if necessary. Add the water and stir well. Next stir the cement in well. If the mixture is too stiff to work with a brush, add water carefully. The resulting slurry should be thicker than ordinary whitewash, but not so stiff that it cannot be brushed into the fabric. When the mixture seems about right, stir in the alum.

The sacks should be thoroughly wetted with water on both sides, and the mixture then applied immediately. Brush a coat evenly on to the outside, working it well in and then go over the inside in the same way. Before the mixture sets add another coat to the outside.

The work sets hard in a day or so and is firm and solid, but not brittle. If not considered strong enough, more coats can be added outside at any time, or, of course, boarding may replace it near the ground, where damage from stock, such as pigs, is possible. Exceptional strength can be had, especially if required for roofing, by adding a second or even a third layer of sacking, each being put on while the surface of the work is wet and immediately covered with the mixture.



A REFLECTOR FOR THE MAIL BOX.

On country roadsides, the sight of a crashed mail box is not uncommon. Here is a bright idea that should preserve the mail box from night driving recklessness or from accident that even the most careful car driver may, at the moment, find it difficult to avoid: Fasten a bright reflector on the proper side of the box, as shown. An ordinary small bicycle reflector will do for the purpose.

A. H. TUCKER, Government Printer, Brisbane.

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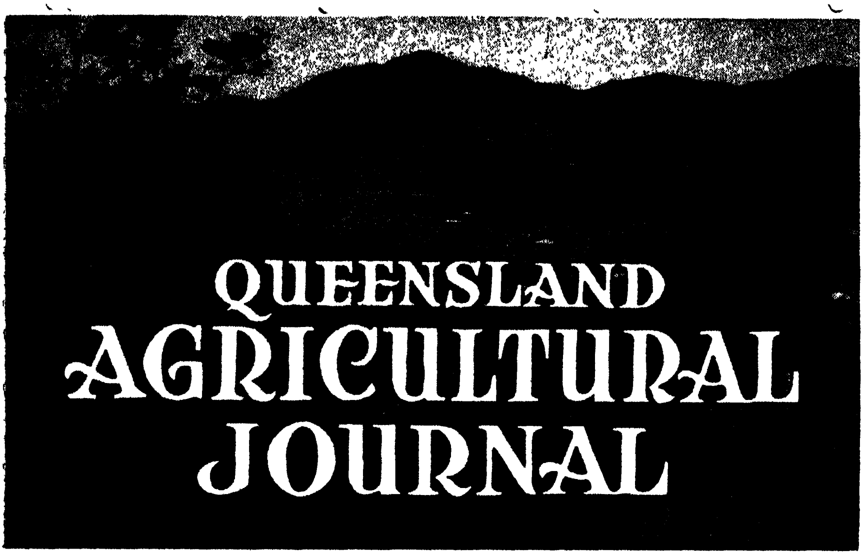

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Event and Comment.

Regional Development—An American Experiment.

THROUGH successive floods, soil erosion, and other causes, destruction and depression came to the once rich region of the Tennessee River Basin—a region about as big as the south-eastern corner of Queensland, with Taroom on, say, its western limit, and with an abundance of mineral and other natural resources. Little had been done to change a rapidly deteriorating situation until about ten years ago, when the Tennessee Valley Authority, known as the T.V.A., was constituted by an Act of the United States Congress. Since then, by flood control, the construction of dams and other great public works, including the provision of cheap and plentiful electrical power, the whole scene has been changed as a result of what has been described as "a unique experiment in regional development"—the sort of regional development constantly in the minds of many Queenslanders with an eye to the possibilities of rural development in this State.

In the present year, the Tennessee Valley Authority has under construction hydro-electric projects which, in addition to electrical power, will provide flood control storage of 15 million acre feet and a 9-foot navigational channel from the mouth of the Tennessee to its upper reaches, 650 miles away.

The Tennessee Valley Authority includes among its general activities the development of agriculture, soil conservation, re-afforestation of cut-over country and other areas denuded of natural vegetation, exploitation of mineral deposits, encouragement of farmers' co-operation in buying, selling, and transport, extension of electrical services to district farms, and general improvement in rural amenities.

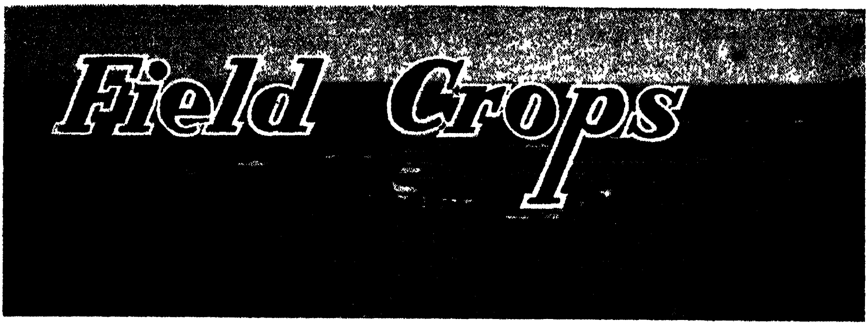
All these things did not come easily. There was the understandable resentment of existing interests, an inevitable corollary to any scheme of reform or progress. In the course of the litigation which followed the inception of the scheme, the principle was established that utilities had no monopoly rights, and that the Government could therefore sell electric power from flood-control dams in competition with private interests. Other difficulties arose, and the majority report of the subsequent congressional inquiry concluded with the statement that "The Authority should be regarded as a settled and established institution in the Valley. Its construction programme should be carried to completion so that the money already invested may not be wasted or inadequately supported by revenue. The agricultural, forestry, public health, and other regional development programmes of the Authority are generally acknowledged to be beneficial to the region and to the nation as a whole and should be continued. The Authority has already demonstrated the value of unified river control under public management. It is on the way to full demonstration of the practicability of promotional rates for domestic electric service which may be adopted as well as by private utilities as under public ownership."

The cost of this experiment in regional development also became a subject of public controversy. It was questioned whether a single authority could deal adequately and efficiently with "such diverse objectives as navigation, flood control, power production, and the many subsidiary activities." On the other hand, the Tennessee Valley Authority was credited with bringing a broad-visioned scheme courageously to the stage of practical achievement. An important factor in its success, however, was that it was commenced during a period of depression when labour and materials were cheap.

In any case, this American experiment, already succeeding in its objects, gives an indication of a new approach to the problems of the land industries, and it may be regarded as a guide, or, at least, as a subject for study when working on our own plans for post-war rural reconstruction.

Among the notable results of the Tennessee Valley Scheme has been the raising of the standard of living throughout the whole region in which it operates. In the scheme there is, it seems, some resemblance to the activities of our own Civil Construction Corps, the operations of which suggest many possibilities in post-war reconstructional planning. In the American example, a remarkable technique in administration has been developed which fits in with that of the local governing authorities in the seven States concerned, and among them there has been a high degree of co-operation from the start. The third annual report of the Authority puts it this way: "The planning of the river's future is entrusted to the T.V.A. The planning of the Valley's future must be the democratic labour of many agencies and individuals, and final success is much a matter of general initiative as of general consent."

As an example of what can be done by real organisation of and within a rural community, the Tennessee Valley scheme is well worth examination by our post-war reconstruction planners—not necessarily for emulation, but for seeing if there is anything in it which may be wisely adopted or adapted.



Grain Sorghums.

C. S. CLYDESDALE, Senior Instructor in Agriculture.

SORGHUMS grown in Queensland may be roughly grouped into three classes—saccharine or sweet sorghums; grain sorghums of which the juice contains little, if any, sugar; and grass sorghums. Of these, it is proposed in this article to deal chiefly with grain sorghums.

In recent years, particular attention has been given to the evolution of dwarf varieties of the grain sorghums which are capable of being harvested by machinery, as is the case with wheat. Success in this direction, by increasing acreage yields and decreasing harvesting costs, has resulted in a great expansion of the acreage cropped with grain sorghums, especially on the Darling Downs. In fact, some yields on the Darling Downs last season were phenomenal, as much as thirty bags to the acre being quite common.

Climatic Requirements.

Sorghums are well adapted to many parts of Queensland, since their requirements for optimum growth are relatively high summer temperatures and a moderate rainfall occurring mainly in the summer. Low temperatures and excessive rainfalls are limiting factors. Frost will kill young sorghum plants, although plants near to maturity display a greater degree of resistance to low temperatures. The effect of frost on the latter may be to retard further development of the stems, but, unless they are very heavily or continually frosted, the leaves will retain their succulence for a month or more, during which their fodder value is maintained. The growth of sorghums, in frost-free areas, can continue throughout a full year and, in the case of some varieties, over a much longer period. Prolonged periods of rain during the growth of a sorghum crop, such as frequently occur in summer in certain tropical areas, favour the development of fungous troubles, particularly leaf rusts, which greatly reduce the value of a crop. Abnormally humid conditions, if experienced at flowering, prevent much of the seed setting and later are apt to cause moulds in the seed heads. Consequently, the growing of sorghums for grain purposes is not recommended under these conditions.

The capacity of the sorghum plant for withstanding dry conditions, which it possesses to a greater degree than any other succulent crop of importance, makes it a particularly valuable plant for Queensland. The young sorghum plants, once established, may remain at a standstill during a dry period of considerable duration, but, when soil moisture is replenished, they will make vigorous growth; whereas maize and many

other summer crops will fail under similar conditions. Although a rainfall that is well distributed through their period of growth is favourable to their maximum development, it is not altogether necessary to obtain a good yield of sorghums. Provided the young plants get a proper start in a moist, well-prepared seed-bed containing a good supply of subsoil moisture they will produce a crop of grain with very little further rain. For fodder or grain, sorghums are consequently of much importance in farming districts of uncertain rainfall, especially where maize and other cereals give unsatisfactory yields.

Suitable Soils.

The soil on which sorghums can be expected to achieve the greatest success is a friable, fertile loam, such as would be considered most suitable for maize or potatoes. Their ability to withstand periods of dry weather enables crops to be obtained, however, on many soils on which maize would fail. Provided there is reasonable drainage, sorghums can be grown on a very wide range of soils, but free-working soils which are easily reduced to a good tilth usually give the most satisfactory results.

Preparation of the Seed-bed.

Although sorghums, as already indicated, display marked ability to grow under dry conditions, they respond to a well-prepared seed-bed containing ample subsoil moisture. It is advisable, therefore, to plough land intended for sorghum-growing early in the spring to a depth which varies with the soil type; in shallow soils ploughing should be from 4 to 5 inches in depth, while in deeper soils with ample organic matter ploughing to a depth of 6 to 8 inches is beneficial. The surface soil should be left in a rough condition to allow of the fullest possible trapping and percolation of the storm rains into the subsoil. Sufficient cultivation should be undertaken after such rains to maintain a clean fallow and to gradually prepare a suitable tilth for the final seed-bed.

Seed.

The use of pure seed of good quality is generally recognised as an important practice in agriculture, and is just as necessary in the case of sorghums as in any other crop. Cross-pollination of sorghums is effected naturally and occurs frequently when two or more varieties are growing in proximity and flowering at the same time. Seed should be obtained, therefore, from a known pure stand that was isolated or grown at least half-a-mile distant from another variety. The seed should be uniformly bright, plump, clean, and free of foreign matter, and should give a full, strong germination; it should be tested prior to sowing.

Time to Sow.

The correct time for sowing the different varieties is largely governed by the climatic conditions likely to be experienced, and the probable length of the period elapsing between germination and maturity.

In inland districts, such as the Darling Downs and the Maranoa, sowings should be arranged to permit the crop reaching maturity before frosts occur, but they should not be carried out too early, as the crop would then mature during the wet season. This applies particularly to crops which are grown for grain and which are to be harvested by

machinery. The grain has no protective covering like maize, and as it readily absorbs moisture the quality will be seriously affected if prolonged wet periods occur when the crop is ripening. Furthermore, the grain would heat if bagged in a moist condition. As a general rule, late November or December sowings will prove most satisfactory.

In coastal districts, sorghums which are grown for fodder are usually sown during January, the crop then being ready for feeding to stock during the later autumn and early winter months.

Sowing dates in Central and North Queensland are governed by the likelihood of rain which, as a general rule, cannot be depended upon until the advent of the wet season, which usually commences in November or December.

Sowing.

The grain varieties are almost invariably sown with a seed drill but the saccharine varieties are frequently sown broadcast, a harrow being used to cover the seed, followed by a rolling, when necessary, to ensure contact of the seed with the soil moisture. When sown broadcast, a sowing rate of 15 to 20 lb. per acre is necessary, the heavier sowing to be carried out on the more fertile soils to encourage the production of fine stems. Broadcast crops are more difficult to harvest and are also more likely to lodge during wind storms than crops sown in drills, and the broadcast method of sowing is therefore not recommended when a seed drill is available.

An ordinary maize planter fitted with a suitable plate is quite satisfactory for sowing small areas, but for large areas a seed drill similar to those used in the wheat areas is the most suitable. The grain runs of a seed drill are spaced 7 inches apart and the desired spacing between the rows is obtained by blocking the required number of grain runs—e.g., by blocking every alternate run a 14-inch spacing is obtained. The sowing rates for a crop sown by a seed drill are given in the following discussion of row and plant spacing.

Row and Plant Spacing.

The correct distance at which to space the rows and the plants in the rows of the different varieties will be influenced by the variety, the soil, and the climatic conditions under which the crop will be grown, and also the purpose for which the crop will be required.

Excellent results are being obtained by some growers who adopt a 7-inch spacing between the rows with the shortest of the dwarf varieties, such as Wheatland Milo, but when this spacing is adopted care should be taken to increase the distance between plants in the rows; otherwise a reduction in the size of the grain is likely to result.

For both grain and saccharine varieties a 14-inch spacing between the rows has proved highly satisfactory on the fertile soils, it being necessary to increase the spacing on the poorer classes of soil. A 21-inch spacing is also very popular, but when adopting this spacing care should be taken to either sow on land which is reasonably free from weeds or arrange to harrow the young crop as soon as the plants are well enough established to stand the harrows. This spacing permits the entry of sufficient light to encourage weed growth, but is too close to permit inter-row cultivation being satisfactorily carried out.

The following quantities per acre and distances between rows are recommended for grain sorghums:—

Row Spacing.	Seed per Acre (lb.).
7 inches	20
14 "	10
21 "	7
28 "	5
35 "	4

Cultivation of the Crop.

When the crop is sown in drills of sufficient width, inter-row cultivation should be practised to aerate the soil, control weed growth, and provide a loose surface to trap moisture.

Single and two-row cultivators, such as are ordinarily used in maize and other row crops, are the most satisfactory for cultivating sorghums. Where the distances between the rows are rather narrow, as in spacings of less than 28 inches, it is advisable to harrow the young crop at right angles to the rows to destroy weed growth. This should be done as soon as the young plants are well established, but it is most important that this be done only during the hottest part of the day and not during dull weather when the plants are inclined to be brittle.

Cultivation between the rows during the early stages of growth may be deep, but succeeding operations in the later stages of development, especially those that are carried out close to the plants, should be shallow so that the surface of the soil is well broken without damaging the roots of the plants. Two-inch cultivator points are satisfactory for the early work, but for the later cultivation broader points, if weed growth is troublesome, should be used.

Harvesting for Grain.

When a crop is grown for grain, harvesting should be delayed until the heads have become thoroughly dry Grain with more than 15 per cent. of moisture, when held in bulk or bagged, is almost certain to heat and deteriorate rapidly in value.

When the area to be harvested is small the heads are cut from the plants in the field by grasping the head with one hand and cutting the stem just below the head with a short, sharp knife.

The usual method of harvesting large areas is by the combined harvester-thresher, but this, of course, can only be satisfactorily done with varieties of comparatively low height. The evolution in recent years of many dwarf varieties, which do not grow beyond a height that is within easy reach of such a machine, has greatly assisted in this direction. Dwarf varieties permit of close spacing of the rows, so that several rows may be harvested in the one trip of the machine. Pure stocks of such varieties produce a very even growth which ripens early and uniformly, and when mature it presents the appearance of a level floor of heads like a wheat crop.

The mechanical harvesting of grain sorghums is practised very extensively in Queensland, and no trouble whatever is experienced in successfully harvesting a number of varieties now in general cultivation, the only adjustments necessary being a slight reduction in the threshing speed and an increase in the spacing of the combs.

Where a thresher or a harvester-thresher is not available for harvesting the crop of grain, satisfactory results can be obtained by threshing the harvested heads with a hackler of the type used for stripping the seed out of the heads of broom millet. When a hackler is used it is necessary to cut the heads off with long stalks in order that they may be held against the hackler drum with safety to the operator. Threshed seed should be well cleaned over a screen or with a blower, because a considerable quantity of broken parts of the seed head is generally beaten off with the seed.

The plant with the heads removed when cured is termed stover. As the grain is thoroughly matured when harvested the feed value of stover is low. In times of scarcity, however, it is of some use in providing bulk when a protein concentrate is fed.

Yields of Grain Sorghums.

From the grain varieties, yields in the vicinity of 60 bushels of grain per acre are frequently obtained under favourable conditions, while under average conditions yields of from 30 bushels to 40 bushels per acre can be expected.

Experiments which have been conducted in a number of districts in which the rainfall is too unreliable for maize growing to be profitable, have demonstrated the ability of several varieties of grain sorghum to outyield maize in those districts.

Grain Sorghum Characteristics.

The grain sorghums, because of their pithy and less succulent nature and their generally lower yield of green fodder, should not be grown in preference to the saccharine varieties, either for feeding in a green state to dairy stock or for converting into silage. They are, however, grown very extensively in some districts for grazing with sheep, the sheep being turned in on the crops when the grain has formed but while the leaves and stalks are still green. Their use in this way is now very popular. During the early stages of growth a prussic-acid-yielding glucoside is present, and great care should therefore be exercised when stock are allowed access to a crop. The outstanting merit of the grain sorghums lies in the generally large yield of grain in which the total digestible nutrients closely approximate those of other cereals.

Sorghum grain is the staple food of millions of the world's population, chiefly in Asia and Africa. As a food for stock, its value is apparent, the nutritive ratio being narrower than that of maize, as shown by the higher protein content. Except for sheep or poultry, it is advisable that sorghum grain be crushed to allow of complete digestion, although it may be fed in the head to animals. Combined with a legume, such as lucerne or cowpea, or a protein concentrate, such as linseed cotton seed, or peanut oil-cake in suitable proportions, sorghum grain may be economically fed to all classes of stock for milk production, growth and fattening. When harvested with a combine, the production or sorghum grain will be at a cheaper rate than is the case with maize.

Grain Sorghum Varieties.

So many varieties of grain sorghum have been developed by selection and artificial cross pollination that in many cases difficulty has been experienced in associating them with one or other of the accepted types such as durra, milo, kafir, and kaoliang.

The first name, durra, which is the Egyptian name for sorghum, was applied to the grain sorghums commonly cultivated in Egypt and in the Anglo-Egyptian Sudan, and it includes the well-known group of varieties known as Feterita. The origin of the milo type is unknown, but the name "milo" originated in the United States of America for an importation from unknown sources. It is thought that milo may be a product of North and North-West Africa and the kafir varieties of Central and South Africa. The kaoliangs are of Chinese origin, the name being that applied to the crop in China.

There are several varieties of Feterita, differing somewhat in height and period of growth to maturity. They usually grow to a height of from 6 to 8 feet. The seed head is erect, 8 to 10 inches long, and is somewhat flattened or wider in one direction than in the opposite one, especially at a third of its height when it tapers off to the tip. The seed is generally larger than that of other varieties of sorghum, is greyish-white in colour, slightly flattened, with glumes light to dark in colour, and frequently tinted with pink. The Feteritas yield well and some are valued for their earliness of maturity. The variety commonly grown in Queensland is favoured by farmers for grazing with sheep more than most other grain varieties.

The period of maturity varies from approximately 75 to 120 days, according to climate, season, and variety.

The milos are distinguished by sturdy stalks, good stooling capacity, abundant foliage, and generally large compact seed heads which are short and cylindrical rather than long. The weight of the seed head in some varieties tends to form a gooseneck which is most undesirable. Standard milo varieties grow from 5 to 7 feet in height, and those of dwarf habit from 2 feet 6 inches to 5 feet. According to climate, season, and variety, maturity is reached between 80 and 130 days.

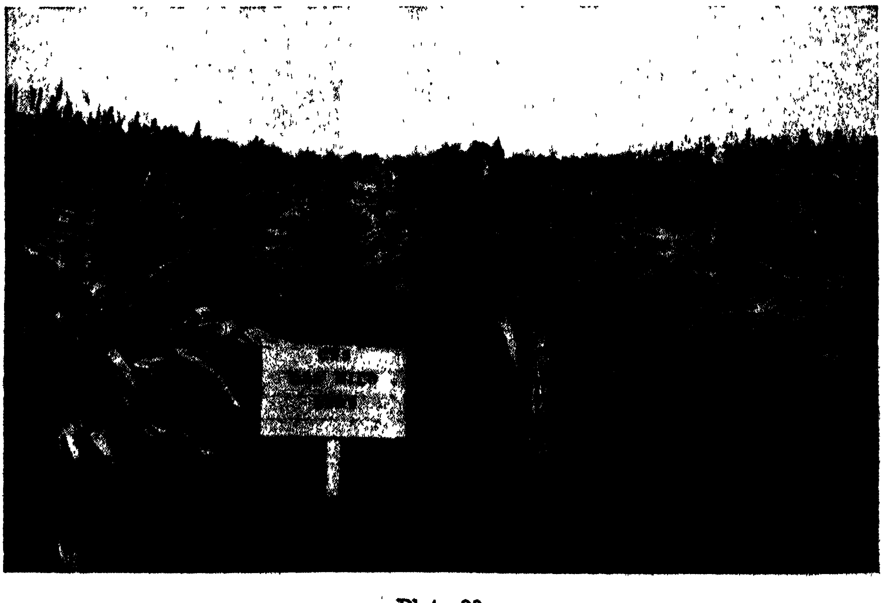


Plate 28.

DAY MILO.—An early grain-producing type suitable for planting in the drier districts.

Plate 29.

KALO.—A kafir-milo hybrid that has produced heavy yields of grain in all districts in which it has been grown.

Plate 30.

TEXAS BLACKHULL KAFIR.—A variety that has given great promise in trials.

The kafirs present perhaps a greater diversity of growth than do those of the preceding types. In some varieties the foliage is heavy and abundant, whereas in others it is somewhat sparse. They do not appear to be so adapted for grain production in the hotter, dry climates as do the milos. The seed heads are much longer than are those of the other types, being 9 to 14 inches in length; they are erect, somewhat cylindrical, and moderately compact; a height of 6 to 8 feet is usually attained. The period of growth is similar to that of the milos.

Varieties of the kaoliang type have never become popular, as in yield of fodder and grain they are inferior to the best of the other types. Their stalks are slender, and are inclined to be dry and pithy, with few and narrow leaves; they grow to a height of from 6 to 9 feet. The heads are ovate, erect, a little more open, perhaps, than in the kafirs, and from 6 to 10 inches long.

Of the varieties of milos that have been grown for some time, Wheatland Milo gives good results on the Darling Downs and in western districts for grain production to be harvested by harvester-threshers. Day Milo (Plate 28) is a variety well suited for grain production on the poorer soils and can be satisfactorily harvested by machinery. The Kalo variety (Plate 29), which is considered to be a kafir-milo hybrid, has given very good results in every district in which it has been grown and is one of the most popular of the dwarf varieties. It is slightly taller than the two milo varieties just mentioned, but it produces a large bulk of foliage, as well as being first in yield of grain. Hegari is also a very popular variety and has given highly satisfactory results in many districts. Like Feterita it is one of the most popular of the grain varieties for grazing with sheep.

A large number of varieties new to the State have been introduced in recent years. In the preliminary trials some of them have yielded well (Plate 30) and it is possible that the best may eventually prove to be more valuable than some of the older varieties just described. As superior varieties are discovered through the comprehensive set of trials being conducted annually by the Department of Agriculture and Stock commercial supplies of seed will be developed for general distribution.

As the investigational programme will doubtless disclose differences in varietal suitability for the various soils and climates of the districts wherein sorghum growing should be profitable, it is suggested that enquiries be made of the nearest appropriate officer of the Department of Agriculture and Stock or of the Head Office at Brisbane for advice regarding the most suitable variety to grow.

Birds and Sorghums.

All grain-eating birds are particularly fond of sorghum seed, and they frequently devour the whole of the crop of seed produced on areas under 5 acres in extent. Where large areas are grown, however, the loss from this cause is negligible; some loss must, of course, still occur, but where the sorghums are extensively grown the loss by bird attack is spread over a very much larger area and the loss per acre is not noticeably high. In the dough stage of the seed, sparrows are most attentive, while later, when a degree of hardness obtains, parrots may be very destructive.

Sorghum Grain Storage.

Considerable care has to be exercised to ensure the safe storage of sorghum grain. Among the most important possible sources of loss to be guarded against are excess moisture in the grain when it is stored, damage by weevil attack, and loss through the depredations of mice.

Unless the grain is thoroughly dry it is liable to heat, and it deteriorates in value if kept in bags or in a larger bulk. However, where care is exercised in harvesting or in drying out the heads before theshing, the grain will usually be dry enough for safe storage. Sun drying, if the grain is thinly spread, is a fairly rapid method for reducing the moisture content of such small grain.

Weevils, especially in the warmer parts of the State, can be very destructive in sorghum grain, if precautions are not taken to prevent infestation by them.

Loss from attacks by mice can be best prevented by storing the sorghum grain in tanks, or by preventing the ingress of the rodents to the barn if the grain is stored in bags.

THE PRESERVATION OF CONCRETE ON THE FARM.

Concrete floors and feeding troughs on the farm often show signs of wear soon after being laid down—a fault which is often due to the action of various acids in milk and some other foods. If a farmer does not do something to prevent further wear, the concrete becomes pitted and quickly breaks up.

This deterioration of the concrete may be delayed successfully by the correct use of a special type of silicate of soda, which is cheap and easy to apply. When mixed with water the solution thus obtained is sprinkled on the surface of the concrete to be treated, is absorbed, and combines with the concrete, forming a tough coating which is impervious to water and acids under ordinary farm conditions.

One gallon of the special silicate of soda is thoroughly mixed with 4 gallons of water. The 5 gallons of solution will suffice for three applications to an area of 300 square feet of average concrete. Very dry or porous concrete will require a fourth application.

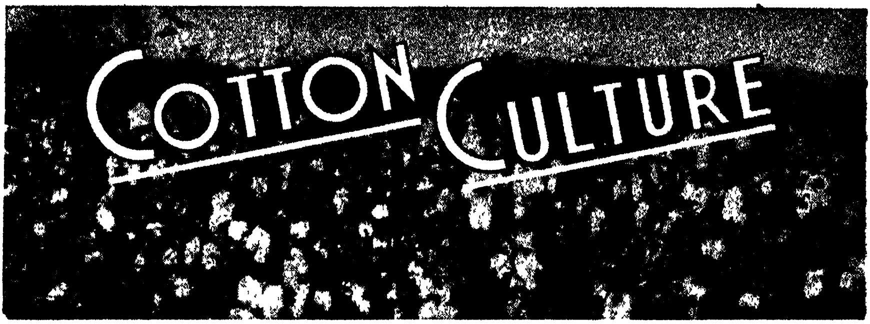
In making new concrete floors, the work should be finished off so that the surface is not very smooth; otherwise the stock will be liable to slip when it becomes wet. When the concrete is firm and nearly dry the solution of silicate of soda in water is applied by means of a spray pump, a watering can with a fine sprinkler, or a mop. Do not flood the solution on, but apply just as much as the concrete can absorb readily. A second, and later a third, application of the solution should be made as the surface dries out each time. For new concrete, three coats should be sufficient.

Worn floors and troughs may be renovated in the following manner:—First, the surface should be thoroughly scrubbed with soap and hot water to remove grease and dirt. Then the area is coated over with a mixture of one part cement to three parts clean, fine sand. When the concrete is firm and drying, treat with the silicate of soda solution as for new concrete.

Floors and troughs in sound condition will benefit by treatment with silicate of soda. The surface should be freed from grease as before mentioned; four applications of solution will probably be necessary, and twenty-four hours after the last application any solution remaining on the surface should be removed with a mop.

Concrete floors and troughs treated in this way last longer, are easier to clean, and dry more quickly than untreated concrete. For best results, the concrete should receive a light treatment once each year following the initial treatment.

When purchasing silicate of soda for conditioning concrete, farmers should definitely state the purpose for which it is to be used to make sure of obtaining the right material.



Cotton Breeding.

R. W. PETERS, Research Officer.

COTTON presents more problems to the plant breeder than probably any other agricultural crop. Not only must the cotton plant have the ability to yield satisfactorily under a wide range of environmental conditions, but the fibres it produces must be able to fulfil the many exacting requirements of the cotton-spinning industry.

Probably one of the most difficult problems with which the Queensland cotton breeder has to contend is the effect on the cotton plant of the unusually high nitrate content of the cultivated alluvial and some of the scrub soils in the cotton-growing districts, particularly when the cultivation has extended over a number of years. This soil condition demands a type of plant that has a sufficiently large framework to carry a profitable yield; at the same time it must also be of an open habit of growth, with a minimum number of vegetative branches, especially large spreading basal branches. Cottons for such soils must also have the ability, after experiencing any setback which may cause serious shedding, to develop a crop quickly instead of making excessive non-bearing new growth as so often happens after such a setback.

The possibility of a lack of early spring rains is always present. When this occurs, the planting of a quick-maturing cotton is essential to allow of a profitable crop being harvested before severe frosts are experienced. Where jassid resistant varieties are not available, it is also advisable to have quick-maturing varieties for late plantings, in order that a good crop can be developed before a severe jassid attack builds up. The cotton breeder in this State is therefore always searching for suitable early maturing types. Quick-maturing cottons are usually of the medium to small boll type, however, and in Queensland, where picking costs are relatively high, it is essential to produce a good-sized boll, which, while remaining storm-proof, will still pick easily. There is also the tendency for very quick-maturing varieties, when planted early, to bear so heavily by mid-season that severe shedding of much of the crop of flower buds and small bolls occurs if stress conditions are then experienced. It is thus necessary to guard against developing strains that lack the ability to withstand dry periods during critical stages of plant growth.

It is not sufficient, however, for only the habit of growth of the plant and the boll characters to be satisfactory. Factors such as uniformity of the length, strength, maturity, drag, and character of the fibres; as well as the percentage of fibres contained in the seed cotton,

the lint index—the amount of fibre per seed—and the amount of fuzz on a seed and the colour thereof, all have to be studied in determining the merits of a cotton plant.

The jassid, which is a small leaf hopping, sucking insect, has in recent years become such a major pest that in many districts the top crop of cotton has frequently suffered severely from attacks by it. Ordinary entomological controls proved unsuccessful and it became evident that the only method of combating this pest was by breeding a strain which is more or less immune to it. This work is now in progress on a comprehensive scale and promising results have already been obtained.

Cotton Breeding Methods.

The examples that have been quoted are presented to indicate some of the many problems confronting the cotton breeders in this State. Two main methods of cotton breeding are being used to solve them. One, which is known as selection, consists of isolating and propagating superior plants of the type desired that occur in the commercial varieties grown here; the other method, which is known as hybridization, consists of crossing two varieties with the idea of combining in one plant the desired qualities of the parents.

Selection Methods.

Selective breeding may take the form of either mass selection or individual plant selection. Mass selection is the simplest form of the selection method, and is of considerable value where an improvement of the general suitability of either an old deteriorated or a newly-introduced variety is required, or where it is desired to maintain the existing standard of a satisfactory variety. In this work the plant breeder decides upon a definite type of plant having certain fibre characteristics as being worthy of propagation. Plants in a field of the variety to be improved are individually examined and those conforming to the desired type are tagged, harvested, and ginned. The seed obtained is planted the following season under isolation from other cotton and when the bolls commence to open, any off-type plants are eliminated. New selections are again made for next year's planting of an isolated plot for further purification. In addition, the seed of the residue plants of the first mass selection plot is saved for planting a multiplication plot in the next season. This increase eventually replaces the parent commercial stock, and in turn is itself replaced by a purer stock obtained from later mass selections. If this method is continued for a number of years a fairly uniform product is finally obtained.

The selection of individual plants followed by row to row testing is the method usually followed by plant breeders when some particular plant type is desired, or a high degree of uniformity of special characters is required. Plant to plant examination is made in a field of some variety which exhibits the desired characters, as in mass selection, but in this case mainly selections are taken which definitely conform to the required type. Some plants may be found, however, that, while not of the desired type, have such a good combination of characters that they appear worth testing. In addition, occasionally a "mutant" or completely new form which breeds true for certain characteristics not possessed by the parent strain may be found.

As a cotton breeder walks along rows of cotton in search of outstanding plants to select, any plant which, at first glance, appears

promising is examined in detail for all of the characters which have already been described. Usually only a few plants are chosen each day that measure up to requirements. These are carefully tagged for further pickings, and a plant description is then made of each one for future reference. Each one is then picked separately and at the end of the season all cotton obtained from each selected plant is forwarded to the laboratory for detailed studying of the fibre and seed characters. The seed cotton of each selection passing these tests is then ginned separately, to enable the lint percentage and lint index to be calculated.

In the following year, seed from the selections retained for further testing is planted in a progeny row test, which usually consists of 50 plants of each selection. During the growing season each row in the progeny plot is carefully examined at different periods to study the development of the plants. When sufficient bolls per plant are open, the most uniform and attractive appearing progenies are carefully examined plant by plant to determine the merits of the important fibre and boll characters. If one of these progenies exhibits a high degree of uniformity in such characters, it is picked in bulk for planting a progeny increase plot and also to supply seed for use in the following season in strain trials with similar progenies and the main commercial stock of the parent variety. If, however, a progeny is variable, the most promising plants may be taken for further testing, but when the variability is too great the whole progeny is discarded.

From the results of these strain trials together with the final test of the increase plots and the laboratory examinations of the fibres, the fate of the progenies is decided. The laboratory examinations at this juncture are made of fibres from one boll per plant taken at comparable positions on consecutive plants in each of the leading progenies and in the parent stock. The examinations consist of again testing the uniformity of length of fibres by passing them through a Baer Sorter, which assists in segregating the various lengths, and thus allows their being calculated as percentages of the whole.

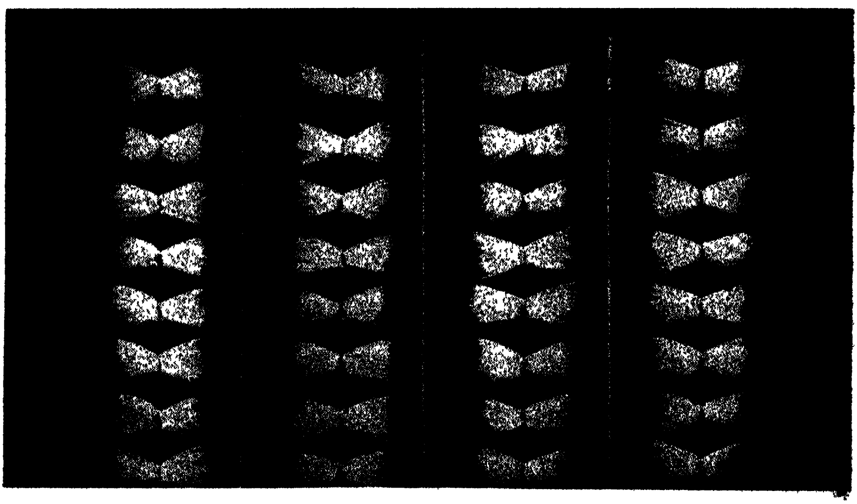


Plate 31.

Combings to illustrate the degree of uniformity which may be obtained in a few seasons by means of the mass selection method. A combing represents one boll per plant collected from comparable positions on successive plants.

Under the varying climatic conditions that exist throughout most of the Queensland cotton belt, strength is a character that it is most essential to maintain. For this reason fibres from each progeny are also treated with an 18 per cent. solution of caustic soda, which reveals the mature, immature, and dead fibres in a sample. If the percentage of dead and immature fibres of a progeny exceeds the parent stock, it is rejected.

If any of the leading progenies surviving these tests are considered to be an improvement on the commercial variety, they are planted as small commercial increases in the following year, and also are included in another strain trial with the parent stock. If the leading progeny at the end of the second season of testing is considered to be of a higher standard than the commercial stock of the variety, it is multiplied for testing in commercial plantings over a range of soils If satisfactory results are obtained there, it is then increased as quickly as possible to replace the commercial stock which is consigned to the oil mill.

Cotton Breeding by Hybridization.

The improving of a variety by either mass selection or individual plant selection obviously requires that it will be possible eventually to obtain the desired type from the parent stock. When it is known that the desired type does not occur in an otherwise satisfactory commercial variety, it is necessary to evolve a strain which will have all of the desirable characters of the commercial variety and also the desired special character, such as immunity to a disease or possibly an insect. Hybridization of the commercial variety with a less suitable variety having the required immunity is employed by the cotton breeder in such instances.

An article describing how the development of jassid resistant varieties is being undertaken in Queensland through the use of both methods of selection as well as by a programme of hybridization will shortly appear in this publication.

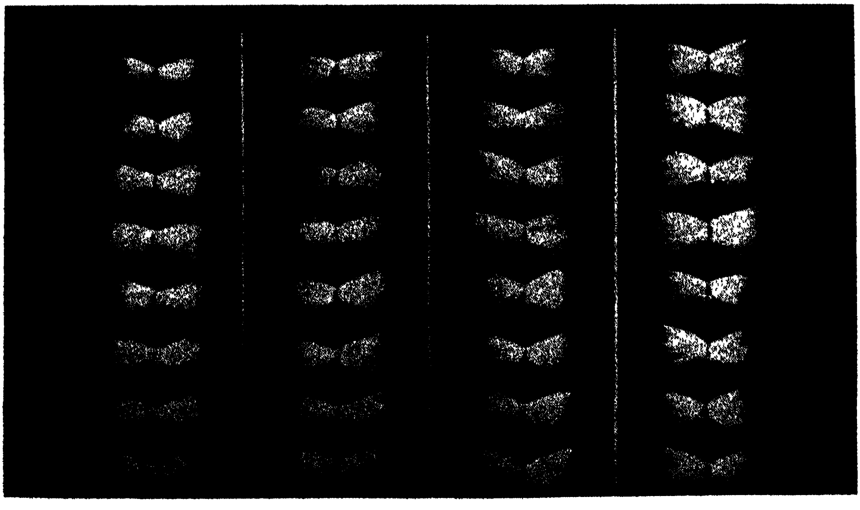


Plate 32.

Combings to illustrate the degree of diversity which may occur in a variety when no method of maintaining a satisfactory standard of uniformity is practised. A combing represents one boll per plant collected from comparable positions on successive plants.

Pure Seed Supplies.

Cotton is an easily cross pollinated plant, and strict precautions have to be taken to reduce all chances of contamination occurring between varieties. It is necessary, therefore, to isolate a variety producing seed for planting purposes, by at least half a mile from other cotton, and also to plant on land where cotton was not grown in the previous season. The greatest care is likewise necessary at the ginneries to prevent an admixture of seed in any of the operations connected with the saving of seed for planting purposes. It is obviously advisable, therefore, to have only the minimum number of varieties necessary to meet all growing requirements, and wherever possible to develop a district on a one-variety community basis. This is being attempted in all cotton-growing countries for it has been demonstrated that not only is it advantageous in maintaining the purity of the variety, but it also assists materially in developing sound cultural practices and in marketing the crop. Any variety of cotton will deteriorate rather rapidly, however, unless the purity of the type is maintained by carefully conducted breeding operations which embrace a system of replacements of pure stocks for every variety grown. The breeding system carried out in Queensland aims at a replacement with pure seed after the stock of any variety has reached its fourth or fifth year of commercial multiplication. By so doing it is expected that it will be possible to maintain a good standard of quality in each commercial variety developed to meet the requirements of the cotton growers and the Australian spinning industry.

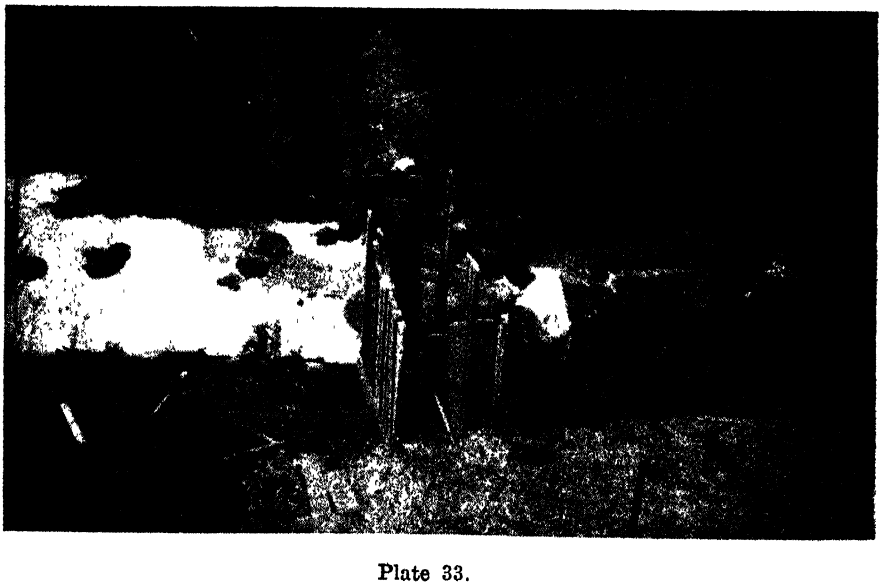


Plate 33.

WATER CONSERVATION ON THE LOCKYER.—A weir in course of construction.

Custard Apple.

H. BARNES, Director of Fruit Culture.

THE Custard Apple or Cherimoya was first grown in Queensland from seeds introduced from South America, and the excellent type which has since developed was derived from one of the first seedlings. It is generally catalogued as Mammoth or Pink's Prolific, and has but few seeds. Another variety known as Island Beauty is a vigorous grower producing excellent fruit. The Bullock's Heart, comparatively smooth skinned, is also popular.

Soils.

Deep, fertile, and well-drained loamy soils are best for custard apples. Planted on shallow soils over impervious subsoils they are not successful. The tree is semi-deciduous and new growth is subject to injury by severe late frosts.

Propagation.

Seeds are sparse in the best varieties, and are often infertile. The seeds which do germinate cannot be relied on to produce true to type, consequently budding and grafting are necessary. Herbaceous or side-

Plate 34.
A CUSTARD APPLE (CHERIMOYA) TREE, REDLAND BAY, NEAR BRISBANE.

cleft grafting is usually practised. Budding is only moderately successful, but may be applied with advantage to unprofitable trees which are being worked over. In selecting scions, the more mature parts near the base of current year's growth are recommended.

Plate 35.
CUSTARD APPLE FRUIT (MAMMOTH).

Planting.

Trees should not be transplanted before the middle of August, and planting may proceed from then until the middle of September. In no circumstances should the soil in the vicinity of young trees be fertilized at the time of or shortly preceding planting. The young roots are very sensitive, and the action following contact with fertilizers has been the

cause of many failures. The distance apart at which trees should be planted varies according to local conditions (mostly of soil), and where it is improbable that upwards of 30-foot spaces would be fully occupied by developed trees, planting is not recommended. Under the most favourable conditions 40 feet is not excessive.

Pruning.

The tree being of rather straggling habit, more pronounced in grafted than in budded specimens, systematic pruning may be applied. For the first three or four years this should be fairly severe and afterwards modified with increasing age, according to development. Being of a pliant nature the shoots or branches, if allowed to grow unchecked, adopt a pendulous or loose habit with more or less of the extremities resting on the ground. Where attempt is made to rectify the position by the removal of the lower placed limbs, the next in succession usually droop and replace the limbs already removed. At planting, the young tree should be topped at not more than 30 inches (24 inches is a fair average) from the ground level, and a single fork formed by two lateral branches allowed to grow for the first season, these in turn being shortened to within about 9 inches (dependent on their vigour) of their bases. Two or more shoots from each "arm" usually develop, of which two should be allowed to remain, and these in turn should be shortened to about 12 inches in the following season. Similar treatment—the duplication of branches from short "arms"—should be applied the following year. Subsequently shortening may be less severe and lateral branches may be encouraged, but these should be shortened sufficiently to ensure rigidity, and thinned to prevent overcrowding.

Pruning the mature trees consists of cutting back those branches resting on the ground, the removal of branches inside the tree which cross and tend to crowd the centre excluding light and air, and the shortening in by one-third to one-half their length of the whip-like terminal growths on the outside of the tree. Early pruning is considered detrimental, and consequently pruning should not be done until the first rise of sap in the spring is perceptible. Pruning before the first rise of sap often results in shy-bearing. The habit of fruiting differs from that of most deciduous trees in that the fruit is produced on the growth of the current year as well as that of the previous year.

Vegetable Production

Vegetable Marketing in Queensland.

JAS. H. GREGORY, Instructor in Fruit Packing.

THE vegetable industry of Queensland has expanded considerably during recent years. While regulation of market conditions has kept pace with expansion in the fruit industry this is not so with vegetables, and lack of suitable standards is often the reason for the forwarding of poor packs to market. Containers have been improved to some extent, but as is probably natural when quality and sizing standards are left to individual producers, quality often shows a considerable variation and this variation is the cause of a wide range of values and market price fluctuations, which makes supervision and checking of sales difficult. It is in the producer's interest to observe regular standards of quality. Experienced growers find no difficulty in maintaining high standards by careful grading and packing. To assist other growers to achieve similar high standards the following hints on the marketing of vegetables are given.

Markets.

Because of advantageous climatic conditions, Queensland vegetable growers have a wide choice of markets. Different modes of transport and types of containers facilitate compliance with the varying requirements of both local and distant selling centres. No matter to which market vegetables are sent, however, the quality of the consignments is of paramount importance in making quick and satisfactory sales.

For distant markets, produce should be consigned in perfect condition, or as near that condition as may be attainable. Even the best of produce may develop defects in transit, so, obviously, faulty second-grade consignments are less likely to open up satisfactorily on delivery. A faulty line which returns, say, 60 per cent. of the value of a quality line costs the same to send; therefore, it is not good business to send any but the best produce to faraway markets.

Methods of Packing.

The Local Market.

For local markets, root vegetables are usually handled in bunches of twelve. Under present conditions, rising prices have sometimes resulted in a demand for smaller lots. Of large root vegetables, it is advisable to reduce the quantity in the bunch from twelve to six to facilitate handling. Sugar bags or corn sacks are used for carrots, parsnips, turnips and sweet potatoes and other vegetables, the tops being removed before bagging. Corn sacks or chaff bags are used for leaf vegetables, such as cabbages and cauliflowers, although they are also marketed loose when road transport to market is practicable. No doubt when timber again becomes available small crates will largely replace bags.

Distant Markets.

Bags or boxes are always used to convey vegetables long distances. Corn sacks are usually used for cabbages, cauliflowers, carrots, parsnips, sweet potatoes, and pumpkins. Peas and beans are generally marketed in a special type of bag; beans are sometimes packed in boxes also. Boxes are best for cucumbers and marrows for long distance consignments.

Branding.

Regulations provide that all produce should have the name and address of the grower, and the type or variety of produce, branded clearly on the containers. The outside of a bag may be stencilled before it is filled. The weight of the contents should also be marked on the bags, or on an attached label strong enough for the purpose. The selling agent's brand should also be placed on both sides of the bag, to save extra handling. If cases are used, the agent's number should be branded on both ends of the case. This facilitates handling, and on interstate markets may also mean the difference of a day or so between sales, a matter of particular importance during hot weather.

Handling Produce.

The necessity for care in handling all produce cannot be over-stressed. When packing bags and boxes, the filled containers should be stacked in such a way as to ensure complete protection of the contents from damage by pressure. Filled bags or boxes should not be used as seats, or as supports for other freight. All produce should be protected from heat after picking and packing. Close attention to these details is particularly necessary for the successful marketing of vegetables at distant places. Produce sent in bulk direct to a local market need not, however, be pre-cooled.

Everything practicable should be done to prevent damage to vegetables during harvesting, as damaged produce becomes second grade

Plate 36.

PRODUCE LEFT OVER AFTER THE MARKET HAD CLOSED.

immediately, besides being exposed to the possible development of disease which may spread rapidly throughout the pack, with resultant loss to the grower.

Beans.

The usual method of marketing beans is by sugar bag or similar container. Because of their close weave, sugar bags are not, however, quite satisfactory when beans have to be conveyed long distances. The so-called "bean bag" with its open mesh is more desirable. Onion bags are too open-weaved for satisfactory use, the beans working through and sticking out like quills on a porcupine, and so becoming easily bruised or broken. For long distance carriage, the tropical fruit case—24¾ inches long by 12 inches wide by 12 inches deep—is satisfactory, a half-tropical case equally so.

If practicable, beans should not be picked during the heat of the day. If unavoidable, however, packed cases should be space-stacked without lids in a cool place, the cases being topped off when lidding. Beans intended for bagging should be spread out to cool before being bagged. Filled bags should be handled carefully and the contents kept dry. Wet beans stacked in bulk generate heat and soon deteriorate. When packing beans in boxes, care should be taken to place the pods side by side to prevent bruising and conserve carrying quality. The easiest way of doing this is to "square" the pods off while picking. For picking, a useful container is a tin or box, 6 to 8 inches in width by up to 18 inches in length by 8 to 12 inches in depth. The tin should be fitted with a folding handle so that the beans may be easily removed while packing. When picking beans, the pods are usually placed across the picking container, but with extra long varieties they may be placed lengthwise, so that the beans may be quickly removed in hand-fulls when packing. This method of harvesting and packing is much easier and faster than haphazard gathering. If practicable, all damaged, short, and misshapen pods should be rejected when packing. When packing in cases it is the practice of some bean growers to immediately cool the beans after picking by immersing them quickly in water, and then allowing them to dry before packing. With this practice, however, the utmost care in handling is necessary to avoid the risk of mould development and "nesting" of the beans after packing. Weather conditions and the maturity of the beans at picking are important factors. The younger the beans and the more hot and humid the weather, the greater the risk of damage. It is only the experienced grower who is able to successfully use this method of handling, as it is still largely experimental. Less experienced growers should take every care if they are to successfully deliver to distant markets.

It is the condition of the beans on delivery that matters. During warm, humid weather, even a small amount of damage through careless or inefficient handling may develop into a condition serious enough to prevent the profitable sale of a consignment, if not to destroy it entirely. Observation of the growth of different plantings will help in assessing the quality of the resultant crop. Beans from picked-over areas should be kept separate from a newly-matured crop. Boxes should not be lined with paper, as free ventilation is necessary When filling bags with beans, the same principle as for filling boxes should be observed if practicable. A small fixture or frame for keeping the mouth of the bag open will make filling easier. Old and damaged pods should be rejected, and diseased beans should, of course, be rigidly excluded from the pack. Various types and grades should be kept separate. Only first grade pods should be packed for long distance carriage.

Cabbage.

To obtain top market price, vegetables should be presented attractively, showing their original freshness; this applies particularly to cabbage. Cabbage grown in the vicinity of markets is usually transported in bulk and then stacked in heaps of different sizes on the selling section. During rush periods, however, a whole load is often placed in a single stack, irrespective of size of individual heads. This practice makes it difficult to assess values. The highest prices are usually paid by the country order buyer and his requirements should be studied accordingly.

Growers are advised to pack all first-grade cabbage in chaff bags. Cabbages should be cut (not pulled), preferably in the early morning. All slightly diseased or insect-damaged heads should be excluded from first grade lots. The culled cabbage may be marketed in bulk, if necessary. Any surplus or damaged outside leaves should be carefully removed. Not all the outside leaves should be removed, however; some should be left on each cabbage to protect the heart Seedy or split heads should not, in any circumstances, be mixed with quality lines, as they are classed as third grade at best. Soft-headed cabbage should be packed separately. If a sufficient quantity is available, cabbage may be classed into four lots of approximate size, each size being packed separately. If a cut is very even, two classes may be sufficient. Many troubles may be avoided by careful cutting. Bags should be well filled, with stalks downward and outward at the bottom and sides of the bag, respectively, to prevent bruising or crushing of the softer portions of each heart.

When filled, the number of heads in the bag should be plainly marked on the side. This is necessary for the buyer's guidance, giving an indication of the size of the cabbages contained in the bag and saving unnecessary handling.

Cauliflower.

No difficulty should be experienced in marketing cauliflowers to the best advantage. The stalk is cut a short distance below the base of the leaf stalks. This short length of stalk gives protection and prevents the leaves from breaking away. All first quality cauliflowers for distant markets should have the sound leaves intact, and folded over the flower to prevent damage in transit.

Clean chaff bags, being light and airy, are the best containers. Corn sacks are often unsuitable, because of previous use for other produce. When bagged, cauliflowers should be packed with the leaves brought together to protect the head. This prevents bruising and discolouration, and keeps the heart white and attractive. The bottom layers in the bag should be placed with the stalk down, and the other cauliflowers placed with the stalks to the outside of the bag to prevent damage to the heads It is even more important to do this with cauliflowers than with cabbage. For a special trade, wrapping in cellophane or greaseproof paper (probably unobtainable in war time) and packing in crates has been found satisfactory, particularly when sending long distances. When packed in crates the side boards are spaced widely to display the contents. South Australian cauliflowers packed this way and conveyed to Cairns in the ship's cool chamber have opened up in excellent condition. In the United States cauliflowers are packed in crates of 16 and 20 heads.

First and second quality cauliflowers should be packed separately. Each bag should contain, as near as practicable, cauliflowers of the same size and quality. Mixed sizes do not sell as well as when the heads are graded. Any cauliflowers showing flower or leaf damage should be packed as second grade. Heads of first-grade cauliflowers should be firm and white and tight. Over-matured or fuzzy-headed specimens are best marketed separately. Stale, discoloured, or wilted heads should be kept separate from quality heads.

Markings should be placed on the bags before filling. Suitable stencils are easily procurable, and save time. The number in the bag should be conspicuously placed on the side of the bag. Packed bags should not be used as seats.

Cucumbers.

When sending the long green type of cucumber to far-away markets, the main essential is to avoid skin damage and so prevent "breakdown" after packing. Cucumbers should be picked while still young and green, and should not be allowed to yellow before removal from the plant. All malformed specimens should be kept out of first-grade consignments. The bushel case is the most satisfactory container to use, the cucumbers being placed across the case in layers or, if large-sized, lengthways. No particular system is used in packing the layers, the fruit being fitted as firmly as sizes permit. If a large quantity is available, it is best to sort them into at least three separate grade sizes, i.e., small,

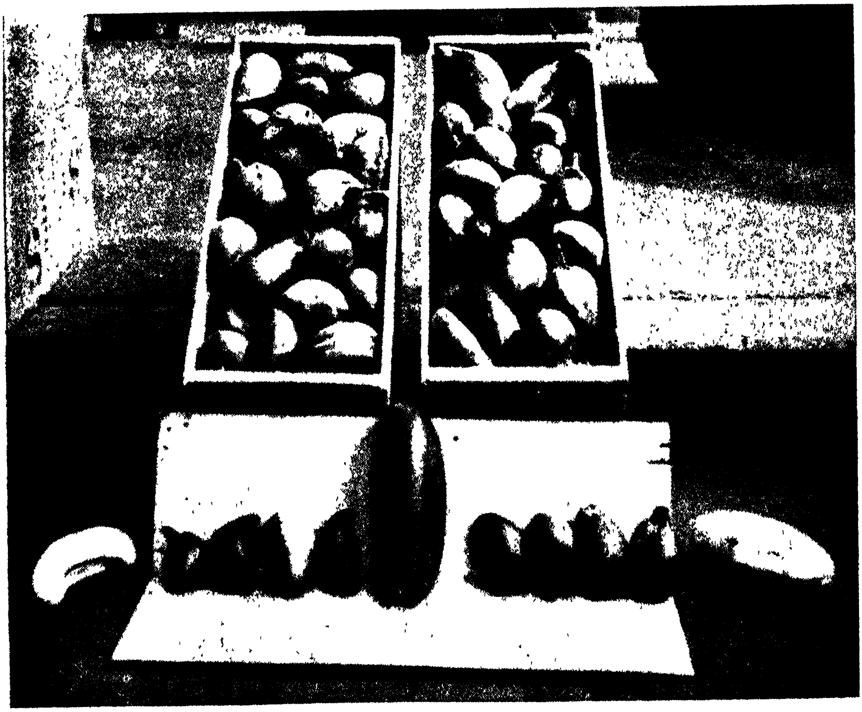


Plate 37.

A CONSIGNMENT OF POOR QUALITY CUCUMBERS.—Note the comparison between the good cucumber in the centre of the picture and the poor pinched ended ones in the cases. This type of produce should never be sent to market.

medium, and large. When packed, the fruit should come slightly above the top of the case, being eased into position by gently bumping the end of the case on a piece of 3 x 2 timber. This keeps the bottom of the case off the floor and prevents damage to the bottom layer. To pack the apple type of cucumber, the same system of diagonal packing as that used for oranges should be applied, using the half-bushel case as the best container. In hot weather, cucumbers should be kept as cool as possible during all operations, and should not be cased unless pre-cooled.

Much trouble is experienced on interstate markets with cased cucumbers through the pulling out of nails, causing lids and bottoms to spring. Long nails should be used and driven home on an angle.

Peas.

The method of harvesting and marketing beans applies also to peas. The sugar bag type of container is mostly used. Some interstate suppliers use a bushel and two-bushel bag, which is popular on southern markets.

Peas should be picked and graded in the cool of the day, and pickings from old and young plants should be kept separate. Insect-affected and otherwise damaged peas should be rigorously rejected. Half-grown, unfilled pods should be left on the plants to fill out. Misshapen and poorly-coloured peas should not be mixed with the first grade. Keeping old and new pickings separate will achieve these results with the minimum of labour. Buyers easily detect the inclusion of old with young peas, and inevitably offer a lower price.

Sweet Potato.

There are two channels of disposal for sweet potatoes—the fresh fruit and vegetable market and the produce market. Growers supplying the fruit and vegetable market are advised to pack in sugar bags, which contain a quantity suitable for most buyers on that market. When sending through the produce market corn sacks are preferable, as on this market larger bulk purchases are usually made.

After digging, the potatoes should be cleaned before bagging. If large quantities are available, they should be sized into three classes and bagged accordingly. The weight of contents should be branded on the side of each bag. Bags should be well filled so that when the top is sewn it is still open enough to permit ready inspection. Top layers should be finished off by placing the potatoes the opposite way to which the sewing thread is stitched, thus making it possible for the sewing cord to hold the top layers securely in position. This method of bagging applies to all long-root vegetables.

Carrot.

The open mesh type is the best bag for packing carrots. With cornsacks, sweating may occur during long distance transport. Only sound carrots, free from skin damage and blemish, should be packed. Single-root types are classed as the highest quality, multi-root types as of lower grade, and split carrots as the lowest grade. Multi-root types should not be bagged with first-quality carrots. A small quantity placed with first-grade carrots will reduce the value of the whole consignment. All carrots for bagging should be topped closely, leaving not more than half an inch of green. When too much top is left on, buyers allow for

this as extra weight and reduce their price accordingly. Too much top may also provide conditions for the development of rot, which quickly reduces the attractiveness of bagged carrots. Carrots should be handled carefully, and should not be washed; washing reduces their storage life. Many consignments of washed carrots examined in Sydney have shown an early development of mould, rendering them unsaleable. Carrots should be sized into three classes—large, medium, and small. Very small carrots ("tiddlers") should in no circumstances be mixed with any grade, as they are almost always rejected by buyers.

For bunch marketing of carrots, the practice has been to wash the roots. Bunches of twelve or six are suitable. The same grade standards as for bagged carrots should be observed. Quality bunches should have all misshapen, diseased, split, or damaged specimens excluded, and bunched for sale as a grade, if worthwhile. Freshness of appearance is very important with bunched vegetables. Seedy carrots should not be marketed with younger roots, as buyers will adjust their offers accordingly.

Plate 38.

SALESMEN TRIMMING AND CLEANING UNSALEABLE CARROTS.—This line had been washed and incorrectly topped and had to be reconditioned and sold at a reduced price.

Beetroot.

In Queensland, beetroot is supplied almost solely to local markets. The practice has been to sell beetroot in the bunch. The same careful treatment as for carrots is advised. Presenting the vegetable with the top looking as fresh as possible is of especial importance. This point in vegetable marketing cannot be stressed too often, for, obviously, the retailer must have fresh-looking vegetables which will appeal to customers.

If beetroot is handled in bulk, bags are used. As with carrots, too much top should not be retained. Tops should be cut, not torn. Skin damage should be carefully avoided.

White Turnip.

Turnips are usually sold by the bunch. Buyers prefer the purple-topped, globe-shaped variety. Marketing methods are the same as with carrots. Bags are sometimes used, the sugar bag type being preferred by the local trade. Careful cultivation immediately before harvesting will prevent the roots from becoming soft and spongy through lack of moisture.

Pumpkins.

For the local market, pumpkins are loose in bulk. Interstate consignments are bagged. Pumpkins should be bagged just before despatch; if bagged for days or weeks beforehand, it will be necessary to empty them out and re-bag before consignment. A convenient weight is 1 cwt. to the bag. Grading for southern markets is necessary, and all immature, overripe, sunburnt, bleached, frosted, insect-damaged, and skin-blemished pumpkins should be rejected. Pumpkins should be cut, not broken, from the vine. Grading into sizes and for quality is essential. Pumpkins are only worth the value of the poorest specimens in the consignment. In no circumstances should faulty pumpkins be mixed with good pumpkins, even during periods of high prices Because of their weight, it is doubly necessary to place the distinguishing marks or brands on both sides of the bags to avoid extra handling and quick delivery.

Plate 39.

A POORLY SELECTED AND BADLY HANDLED LINE OF PUMPKINS.—A more careful selection by the grower would have avoided what was almost a total loss.

Marrows.

On the local market, marrows are either marketed loose in bulk, or in bags; but for long distance transport cases are used, as they are much more susceptible to injury than pumpkins. The tropical fruit case—24¾ inches by 12 inches by 12 inches internal dimensions—is the most suitable container. Packing is the same as with cucumbers; the selection and fitting in of the marrows being left to the commonsense of the packer. Small marrows should be excluded from all consignments.

Summary.

In concluding these hints, the following points are again stressed as fundamentals of successful marketing of fresh vegetables:—

Vegetables should be handled carefully, and should be fresh in appearance at all times.

Freedom from disease is essential.

Grading for quality—damaged vegetables should never be sent to distant markets.

Low-grade vegetables should only be marketed when the price is payable, and always as second or third grade. Unsaleable rubbish becomes a carry-over and soon accumulates on market sections, causing sharp price drops.

Over-marketing of inferior grades is usually the cause of low prices, NOT over-supply of quality produce.

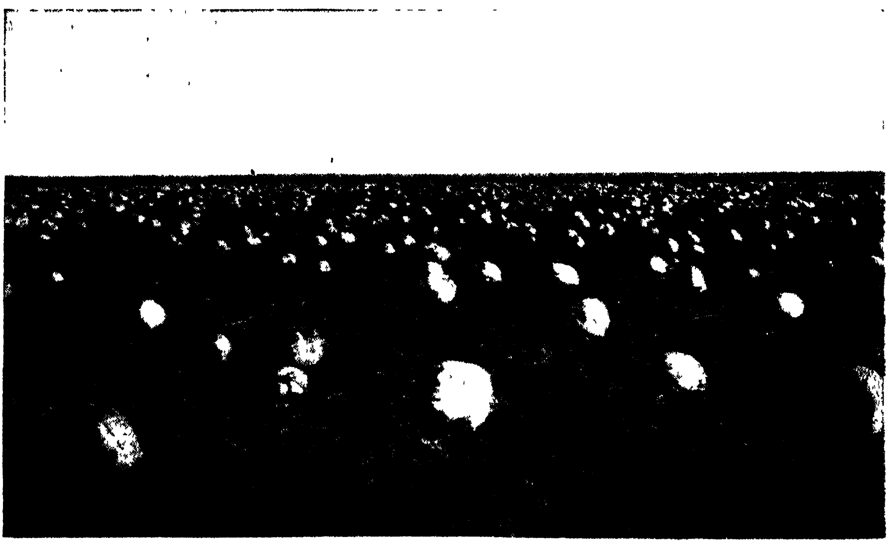
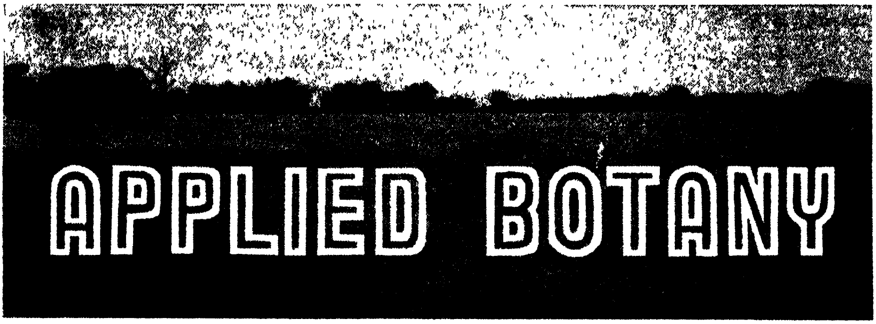


Plate 40.

PROLIFIC CROP OF CATTLE PUMPKINS ON CONDAMINE PLAINS.



Queensland Trees.

THE TALLOW-WOOD.

THE Tallow-wood* is a very large tree with reddish-brown, fibrous bark. In the more open forest, and on poorer soils it is frequently still a large tree, with the trunk usually very gnarled and branching from near the base. The outermost bark is shed in very small flakes or patches. The inner bark is fibrous and light brown. The stump shoots often have a purplish tinge, and the leaves are comparatively thin in texture, and rather shorter and broader than in most eucalypts. The ordinary leaves are also comparatively thin in texture in comparison with most other eucalypts. The flower-buds are club shaped. The seed capsule is narrow, about $\frac{1}{2}$ inch long and about $\frac{1}{4}$ inch in diameter. Its range is from Fraser Island, Wide Bay, in Southern Queensland, to a little south of Newcastle, New South Wales. The yellowish, somewhat greasy timber has an excellent quality for all purposes exposed to weather, particularly for sleepers, verandah posts, and flooring. The Queensland Sub-Department of Forestry recommend the timber as especially suited for dancing and skating floors, the greasy wood wearing evenly with a smooth and slippery surface. It does not rust ironwork. In seasoning the wood does not warp or crack to any extent, although it shrinks perceptibly. The only disadvantages are that paint and varnish are long in drying when applied to it, and as a pole timber it is inclined to split somewhat freely when exposed to the sun, and consequently has to be bound with iron. It lasts, however, a very long time in the ground.

* *Eucalyptus microcorys.*

NOTICE TO READERS.

Because of the present necessity for strict economy in the use of paper, readers are requested to renew their subscriptions promptly. If renewals are unduly delayed, it may be impossible to supply back numbers of the Journal.

Address all renewals and other correspondence to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Plate 41.
A HANDSOME TALLOW-WOOD GROWING AT ASHGROVE, NEAR BRISBANE.

Plate 42.
FLOWERING AND FRUITING TWIGS OF THE TALLOW-WOOD.—
The leaves in the left-hand corner are from a stump shoot.

"Lion's Tail"—A Possible Serious Weed Pest.

C. T. WHITE, Government Botanist.

SPECIMENS of "Lion's Tail,"* a weed new to Queensland and which may become a serious pest in pastures, especially along rivers in Central and North Queensland, have been received recently for identification. The subjoined illustration and description will enable pastoralists to recognise it should it make its appearance on a property.

Description.

The plant attains a height of 6-8 feet; the stems and branchlets are markedly four-angled. The leaves are opposite one another, have bluntly toothed edges, and are 2-5 inches long. The chief characters of the plant are the burr-like clusters of flowers borne at intervals along the branches. The flowers are orange-red and when in full bloom the plant is highly ornamental. The objectionable nature of the plant is due mainly to the very spiny calyx, which consists of a green tube 1 inch long at the base of the flower and ending in eight sharply pointed teeth, the upper one much larger than the others.

Properties.

Little is known of the plant, although it is widely spread over the tropics of the world. Cook and Collins, in their *Economic Plants of Porto Rico*, say that at Arecibo (West Indies) the plant is regarded as poisonous. A correspondent, Mr. H J. Tyack Bake, says that the plant has become firmly established in parts of the Northern Territory, forming thickets through which it is almost impossible to penetrate. An allied species† is moderately common in garden culture in Queensland. It is a native of South Africa, more showy than the species here illustrated, lacks the objectionable spiny flower and seed clusters, and shows no indication of becoming a pest in any way.

* *Leonotis nepetaefolia.*

† *Leonotis leonurus.*

Plate 43.

LION'S TAIL.—A possible serious weed pest.

(*Reproduced from the "Economic Plants of Porto Rico" by O. F. Cook and G. N. Collins. Contribution from the United States National Herbarium, Vol. 8.*)

PLANT PROTECTION

Citrus Aphids.

J. HAROLD SMITH, Senior Research Officer.

DURING the spring and early summer months, aphids are frequently troublesome in citrus trees in all parts of Queensland. Three distinct species have been recorded on oranges, mandarins, lemons, and grape fruit, but being similar in habits and much alike in appearance, they present, for all practical purposes, a single control problem. They are small, black or greenish-black, soft-bodied insects, which occur in dense colonies on the young shoots (Plate 44). In such colonies there may be winged adults, wingless adults, and the smaller immature stages, none of which exceeds one-tenth of an inch in length. All are equipped with highly specialised mouth parts, by means of which they pierce the leaf or shoot and extract the plant sap. Part of the sap escapes from the injured tissues and mixes with secretions of the insects themselves to produce a sticky fluid on which dark-coloured moulds develop and more or less cover the infested parts of the plant. Ants, especially species which feed on sugary substances, are attracted to the trees.

Nature of the Damage.

The immature, partly-opened leaves of infested shoots soon show signs of crinkling and later appear scorched. There may also be a certain amount of die-back at the tips. If the attack is severe and prolonged, subsidiary buds may develop and give a bunched appearance to the young growth, though such a malformation is considerably less acute than that produced by the citrus bud mite. As the infestation may persist from the first appearance of young growth in spring until the fruit is set, the pest has a twofold significance—plant growth is checked and fruit setting may be interfered with, particularly in a dry season, when the trees are suffering from stress conditions.

Control.

Aphids on citrus trees have many natural enemies, chief among which are the small, yellow, black-spotted ladybird beetles and the sluggish, grub-like larvae of hover flies. Though these predators destroy large numbers of the pest, injurious symptoms are frequently apparent before sufficient of them are present to appreciably reduce aphid populations. It is therefore unwise to depend on these and other natural enemies to keep the aphids in check.

Nicotine is the insecticide used in controlling citrus aphids and it is applied in a dust or a spray. Spot treatment of any trees on which colonies are seen early in the season will often suppress an outbreak

before it assumes any great importance, and should be a routine practice in all orchards where the pest is liable to occur every year. If this fails to give control, or if the pest is not seen until it is widely distributed through, and numerous in, the orchard, all trees must be sprayed or dusted twice with an interval of seven to ten days between the two treatments. As the insects are almost entirely restricted to the new growth on the outer fringe of the trees a drenching spray applied from the outside is quite adequate, provided cultural operations include the removal of water shoots on the main limbs. These water shoots are of no value, and are particularly attractive to citrus aphids. There is normally no need to operate the boom from the inside of the tree, as is done when sprays are applied for the control of most pests and diseases of citrus.

Plate 44.
CITRUS SHOOT INFESTED WITH APHIDS.

A nicotine spray can be prepared on the orchard to the following formula:—Nicotine sulphate, ½ pint; soft soap, 2 lb.; water, 50 gallons. The soap is first dissolved in about two gallons of warm water and the solution added to the other 48 gallons in the spray vat. Just before spraying is to begin, the nicotine sulphate is poured into the vat while the agitators are working. Power spray equipment gives the most satisfactory results, but a knapsack pump is reasonably effective for spraying a few trees which are small enough to be given an adequate cover without any great difficulty. Careful treatment is, however, essential for a few survivors from the double spray can soon produce pest populations again if weather conditions are suitable for the insect.

Dusts used as an alternative to sprays must have a nicotine content of at least 3 per cent. Properly mixed dusts of the prescribed quality are sold by most dealers in insecticides, and should, of course, be applied to the trees with a rotary or comparably efficient dust gun capable of distributing the insecticide over the trees.

Downy Mildew and Powdery Mildew of the Cucumber.

F. W. BLACKFORD, Assistant Research Officer.

THE two most destructive diseases with which cucumber growers have to contend are downy mildew and powdery mildew. These two mildews are usually to be found in every cucumber crop in Queensland, the former being the more destructive of the two; they nearly always occur together, and such dual infection frequently results in heavy losses.

The first symptoms of downy mildew are the light-yellowish to yellowish-brown spots which develop on the older leaves of the vines. When high humidity prevails, the under side of these spots is covered with a light-mauve coloured down, which is the spore-bearing portion of the fungus causing the disease. The spots enlarge, turn brown, and ultimately dry out, thus giving the leaf a scorched appearance. The dried-out tissue tends to break away, and very often only the main veins with a ragged edge of attached leaf-tissue are left; the leaf frequently curls up and becomes claw-like in appearance. The disease progresses from the centre of the plant outwards, so that, on severely affected plants, all that remains of a runner may be the few green leaves at the tip. The cucumber fruit is thus exposed to the sun, and severe sunburning often occurs.

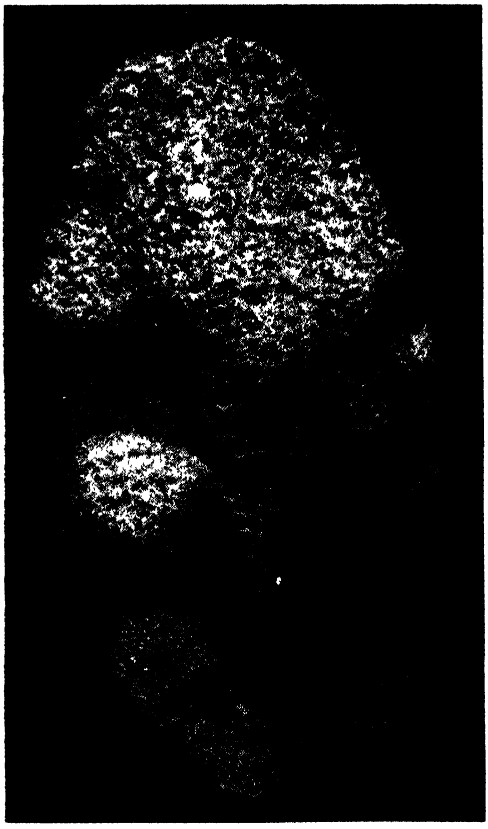


Plate 45.
SEEDLING CUCUMBER LEAF SHOWING PATCHES OF POWDERY MILDEW.

Because the fungus which causes powdery mildew is so readily observed, this disease is often blamed for the loss due to downy mildew, whereas usually it is merely intensifying the injury caused by the latter. The white, floury patches of the fungus causing powdery mildew (Plate 45) are found on both sides of the leaves and on the stems, and are very distinct. At first these patches are not much larger than a threepenny piece, but later they may enlarge to cover the whole of the leaf with a greyish-white powdering of spores. As is the case with downy mildew, the oldest leaves in the centre of the plant are attacked first; they turn from green to yellow, then to brown, and finally dry out and crumble away, thus exposing the fruit to sunburning.

Control.

The infection of a cucumber crop by downy mildew may be prevented by the application of copper sprays or dusts. As Bordeaux mixture has been recorded as exerting an adverse effect on the growth of cucumbers, growers who intend to spray are advised to use home-made cuprous oxide mixture, at a strength of 3 gallons of the stock solution to 40 gallons of water, or to use one of its commercial equivalents. Spraying or dusting should commence shortly after the plants are above ground, and applications should be made as often as is necessary to keep new growth covered. Both surfaces of the leaves should be sprayed or dusted as thoroughly as possible.

The development of powdery mildew infection may be checked by dusting with a mixture of equal parts of dusting sulphur and hydrated lime or by using one of the commercial sulphur sprays marketed in Queensland as wettable or colloidal sulphur. This disease differs from downy mildew in that the sulphur dust or spray will actually kill the fungus after it makes its appearance. Hence sulphur applications may be delayed until the floury patches are noticed on the leaves, whereas the copper spray or dust, used for the control of downy mildew, must be applied before the disease appears.

As mentioned previously, the two diseases generally occur together, and consideration should therefore be given to the question of spraying or dusting with a combination mixture. The copper sprays or dusts used to prevent downy mildew will serve to delay the appearance of powdery mildew, but nevertheless it may be necessary to occasionally also apply sulphur for the control of the latter disease. If sprays are being used, this can be accomplished by applying a combination mixture of one of the wettable or colloidal sulphurs referred to earlier and either home-made cuprous oxide or one of its commercial equivalents. If dusts are preferred, dual purpose dusts containing both sulphur and copper may be used; these can be purchased from commercial firms selling spraying or dusting materials. The sulphur included in these combinations, in addition to dealing with powdery mildew, will also serve as a control for any red spider infestation which may be present.

If the grower is purchasing a dust, consideration might be given to a mixture containing copper, sulphur, and lead arsenate; such a dust would control downy mildew, powdery mildew, red spider, and any leaf-eating insects which might be present on the cucumber vines. If he is using a spray and leaf-eating insects appear, the position can be met by adding lead arsenate to the spray. There is a possibility that undesirable quantities of lead arsenate residue may accumulate on the skin of the fruit if this insecticide is incorporated in a spray or dust applied late in the development of the crop; there is, of course, a safeguard to the consumer in the fact that the skin is removed before the fruit is eaten. Nevertheless, it is desirable to concentrate on the control of leaf-eating insects at an early stage in the growth of the crop. By doing so, the necessity for arsenical applications during the later stages of its development may be eliminated.

Fruit Fly Luring Investigations.

N. E. H. CALDWELL, Assistant Research Officer and
A. W. S. MAY, Assistant Research Officer.

DURING recent years, investigations on the control of fruit flies in Queensland have been mainly concerned with the development of improved lures. The original objective of the work was to determine what components of certain complex mixtures are attractive to fruit flies and then to build up more efficient formulae. It was soon found, however, that marked improvements on existing lures could be made rather rapidly by simple, empirical methods. The following account deals largely with results obtained by these methods.

Location of the Work.

Most of the field experiments have been conducted in the citrus orchards of the Maroochy district with Nambour as the centre. Some work was also carried out in citrus at Gayndah and in deciduous fruits at Toowoomba and Stanthorpe. The citrus areas proved by far the most satisfactory for experimental purposes, as large numbers of flies are almost invariably present in the orchards during spring and autumn. In deciduous orchards, on the other hand, the fruit fly populations vary a great deal from season to season, and much time may be lost on experiments which prove abortive because flies fail to appear in sufficient numbers to give significant results.

Confirmatory experiments with promising lures were carried out in districts other than Maroochy and, so far, the best lures have given satisfactory results wherever they have been tested.

Methods Employed.

All experimental work has been carried out under orchard conditions. A common type of screw-top glass fly trap, without legs, has been used throughout the investigation.

After preliminary work of an exploratory nature in 1939, a standard form of experimental design was adopted for the so-called elimination trials, i.e., trials to decide if new formulae deserved detailed investigation. This design, a randomised block, permitted a comparison of six lures, each lure being replicated four times. Of these six lures, two, the efficiency of which is well known, were adopted as standards. These were included in each experiment so that results from all such experiments could be compared with some degree of accuracy.

One trap, regarded as a unit plot, was hung in either adjacent or alternate trees in any one experiment, the choice depending on the number of trees available. Traps were hung in similar positions in any one season's experiments, the position in each tree being fixed at the beginning of an experiment. Errors due to positional effects were, to some extent, avoided by rotating the traps in a pre-determined direction at regular intervals, either one or two days, so that at the end of the experiment each trap had spent an equal period in each tree used in any one replication of the six lures being tested.

The early experiments lasted for only six days, the traps being changed from tree to tree every day. Later each experiment extended

over twelve days, and the traps were moved at two-day intervals. In the latter case, the traps were recharged with fresh lure at the end of the first six days, unless information on the period for which lures remained attractive was required. The six-day period was primarily determined by the type of experimental design, but it was soon found that, under ordinary field conditions, the traps needed refilling at about this interval.

Other experimental designs, involving the simultaneous comparison of a larger number of lures, have also been used. These designs were of value in determining the optimum proportions of ingredients in lures and in making final comparisons of a number of the more efficient lures.

Flies were counted and the sexes recorded either at intervals during the experiment—usually on the days when the traps were changed from tree to tree—or at each recharging of the traps. All the data obtained were examined statistically.

In all districts, and particularly in the coastal areas, many species of fruit flies enter the traps, though a few well-known species make up most of the catch. Little is known of the habits and importance of the remainder, some of which are apparently unnamed. The fruit flies caught have been identified whenever possible, in order to determine the proportion of pest species in the total catch. When the large number of fruit flies caught made positive identification of each specimen impracticable, a fairly accurate picture of the numerical abundance of each species was obtained by sampling methods.

Using these methods, nearly 300 lures were tested between 1939 and 1941, when the investigation was temporarily suspended

Type of Lures Tested.

The materials used in experimental work may be roughly classified as follows:—

A. Alkalies, e.g., ammonium carbonate, caustic soda.

B. Complex organic substances, e.g., orris root, cotton-seed meal, maize meal, flour, pollard, bran, fruit rind, meat extract, preserved yeast, molasses, honey, natural vanilla essence, aniseed oil.

C. Simple organic substances, e.g., carbohydrates—arrowroot starch, sugar; proteins—gelatin; aromatics—ionone, vanillin, coumarin.

D. Preservatives, e.g., corrosive sublimate, borax.

E. Yeast cultures.

The attractiveness of ammonia in very weak concentration to some species of fruit flies is illustrated by the ammonia-vanilla lure used in controlling the Queensland fruit fly for a considerable number of years. Examination of another lure formula suggested that the addition of other substances to ammonia considerably enhanced its attractiveness, and it was soon found that mixtures of ammonia with pollard, bran, or orris root caught a larger number of fruit flies than the ammonia-vanilla solution. In fact, it appeared that vanilla was unnecessary and might even be detrimental to lures in which ammonia was an essential constituent. As soon as the value of such mixtures was

realised, considerable attention was given to the development of lures which might serve as interim recommendations for fruit growers. Some of these are given below, but other very promising formulae are omitted as some of the ingredients are not now readily available.

A few lures and baits used in other countries against fruit flies have been tested. Some of these caught a considerable number of the Queensland species, but all are inferior to the lures now recommended for trial by the growers.

Lure Recommendations.

Lure 1.—Cloudy ammonia, 1 teaspoonful; pollard, 2 level teaspoonfuls; rain water, 1 pint.

This lure catches fruit flies in large numbers, being apparently more efficient in spring than in autumn in citrus districts. It has the disadvantage of catching considerable numbers of blowflies, which tend to foul the trap after a few days. Although some of the lures mentioned below also possess this fault they attract more fruit flies and, accordingly, are now recommended in preference to Lure 1.

Lure 2.—Pollard, 5 level teaspoonfuls; ammonium carbonate (chemically pure), 1 level teaspoonful; tank water, 3 pints.

This lure is more efficient than Lure 1, but is not equal to Lure 4. It also catches large numbers of other insects.

Lure 3.—Maize meal, 5 level teaspoonfuls; ammonium carbonate (chemically pure), 1 level teaspoonful; tank water, 3½ pints.

This lure shows promise of being superior to the pollard mixtures (Lures 1 and 2). Few insects other than fruit flies are attracted to it, and the fouling of traps is, therefore, of little importance.

Lure 4.—"Dribarm" preserved yeast compound, 3 level teaspoonfuls; ammonium carbonate (chemically pure), 1 level teaspoonful; tank water, 3½ pints.

This lure has seldom been surpassed in the number of fruit flies caught. However, it also catches large numbers of insects other than fruit flies. Traps quickly become fouled and should be thoroughly cleaned before recharging.

Lure 5.—Rind and rag of one ripe or ripening orange, about 2½ inches diameter; concentrated (18 per cent.) aqueous ammonia, 6 teaspoonfuls; tank water, ¼ pint.

Shred the orange rind finely with a sharp knife. Add the ammonia and water and keep in a tightly-corked container for 24 hours. To make up the lure ready for the traps, take 2 tablespoonfuls (8 teaspoonfuls) of the liquid and add to 3½ pints of tank water.

Lure 5 is one of the most promising so far developed. Its attraction for fruit flies appears to be at least as good as that of the maize meal or pollard lures, and it catches practically no insects other than fruit flies.

In experimental work with these lures the traps were recharged with fresh material every six days. Until more is known of their performance this interval should not be exceeded. On the other hand, under conditions of high evaporation and large catches it may be necessary to recharge the traps at shorter intervals.

The Corriedale.

J. L. HODGE, Instructor in Sheep and Wool.

THERE is a bright future for the Corriedale in Queensland. Judged from any point of view this breed has, as in other States, come to stay. The Corriedale proper was evolved about 65 years ago by crossing the Lincoln with the Merino. The breed is now regarded as pure bred. A breed is said to be pure when it will reproduce its type with certainty. The Corriedale will become more general in Queensland than as a farmer's dual-purpose sheep, and the time is fast approaching when this breed will be run extensively on marginal areas of the Darling Downs, and especially on much of the rich brigalow and belah country reclaimed from the prickly pear infestation

There is a tendency with some Queensland sheep men to breed the Corriedale too fine. This is a mistake and to some extent nullifies the reasons for which the breed was evolved. Loss of size and constitution follow too fine a fleece.

The covering of the Corriedale should be strong—somewhere about 54s 56s quality—and with strength should go length. A strong, short wool is common and not to be desired. The fleece should be bright. Scientific culling in a Corriedale flock should proceed from both ends, as it were. Anything tending to too much Lincoln is undesirable, and anything showing too much of the Merino type should be rejected. Conformation and size, too, have great weight with this fast-improving breed.

As in other Australian States, there is no breed of sheep so fast increasing in general favour. With the increasing importance of the fat-lamb industry in Queensland Corriedale flocks will assuredly increase in number.

Queensland lands generally suit the Corriedale remarkably well, and on rich scrub lands individual animals attain a great size.

Of the utmost importance to improvement and maintenance of the standard to which this valuable breed of sheep has attained is the matter of culling, which should be rigorous. Because a strong fleece is desired, as compared with the Merino, is no reason why a rough fleece should be accepted. Quality and character are just as easily attained in a strong as in a fine wool.

In the fat lamb industry, it is confidently anticipated that even greater use will yet be made of the Corriedale. The breed is easily domesticated—a very important point in farmers' flocks—and the ewes

are excellent milkers. This characteristic combined with feeding on cultivated crops ensures the early maturity which is so desirable in the fat lamb industry.

There is, too, a constantly increasing demand on the world's market for Corriedale wool properly bred. In fact, the prices obtained for Corriedale wool compare more than favourably with some merino clips. Other points in favour of the breed are the weight of wool cut per head, and the fact that these sheep are less susceptible to fly strike.

CROSSBRED EWES FOR FAT LAMBS.

As 98 per cent. of the sheep population of Queensland consists of merinos, farmers are obviously at some disadvantage in respect of the availability of the right type of ewe for the breeding of early-maturing spring lambs. Farmers who are using long-wool rams—such as the Romney Marsh, Border Leicester, or Lincoln—are, therefore, strongly advised, in their own interests, to retain at least some of the ewe drop as their future breeders.

From a purely monetary point of view such a practice would undoubtedly pay. While the cry is always that crossbred ewes of the right type are either too expensive or unprocurable, year in and year out, ewe lambs are slaughtered in Queensland which, if kept for breeding, would have a most beneficial effect on the production of fat lambs. Farmers not in a position to hold all the ewe drop from the long-wools should, at least, retain some proportion each year with the idea of eventually working into a crossbred flock.

—J. L. HODGE.

TRUCKING FAT LAMBS.

Bruising of lambs on the way to market is not uncommon, but to a great extent the remedy is in the hands of growers.

The tenderness of sucker lambs is often not appreciated, and they are handled frequently like fat sheep. Sheep, too, may be bruised by bad handling, though not so badly as sucker lambs. It should be remembered that true sucker lambs have never been off the mothers. It is advised, therefore, that if a road journey has to be undertaken some of the ewes should accompany the lambs to the trucking yards. Untrained dogs should not be used for yarding the lambs. A lamb should never be lifted by the skin. Prodding sticks should never be used. Over-crowding in the trucks should be avoided entirely. In all cases, every endeavour should be made to deliver the lambs at the market with the bloom on them. A certain loss in weight and appearance is unavoidable on a long journey, but if the foregoing rules were observed strictly complaints of bruising would be rare.

—J. L. HODGE.

Farm Made Butter—Churning Difficulties.

O. St. J. KENT, Senior Dairy Technologist.

MANY requests have been received from farmers and house cow owners for advice about cream which they have not been able to churn into butter At this time of the year, difficulties in churning are likely to occur, especially with cream from a few house cows or a single herd. There are several reasons why, on occasions, the churning process takes a long time or fails completely in home butter making, viz.:—

(*a*) Dry winter feed.
(*b*) Cows in advanced lactation.
(*c*) Thinness of the cream.
(*d*) Lack of proper ripening of cream.
(*e*) Overloading the churn.
(*f*) Cream too cold.

Dry Winter Feed.

During cold weather butter-fat is usually much harder than it is in summer. This is due to the feed of the cows. In winter the feeds are dry and hard compared with the abundant luscious, green, softer food of the summer. When fat is soft, it is easy for the fat globules to be brought together to form butter in the churn, but when the fat is hard it is much more difficult. It is realised that it is not always possible or easy to change the diet of a cow, but where one is able so to do, the feeding of some succulent feeds such as silage, roots, or concentrates rich in vegetable oils such as linseed meal will produce softer fats and consequently easier churning. However, a cow should not be suddenly changed from one food to another.

Cows in Advanced Lactation.

Milk from cows well advanced in lactation differs in a number of ways from milk in the earlier part of the lactation period. In the first place, late lactation milk contains fat globules which are much smaller in size than normal milk. The presence of these very small fat globules makes it difficult to churn cream from such milk into butter, because the small globules are capable of resisting the force of concussion exerted during the churning process. Also, cream from late lactation milk is more viscous or sticky than ordinary cream and,

consequently, is more resistant to the churning process. The viscosity or stickiness of the cream is associated with the higher protein content found towards the end of the lactation period The addition of small amounts of dry salt to the cream will reduce the viscosity and improve the churning qualities of the cream. At times the addition of small amounts of hot water to the cream has been found of benefit with stubborn cream. In the case of cream from a herd of cows, it may be advisable to dry off those cows which are most advanced, or to exclude their milk from that used for separation.

Thinness of the Cream.

Sometimes, cream is separated with a test of 25 per cent. or less. Thin cream such as this is more difficult to churn than richer cream, because the proportion of serum to fat is greater. Churning depends on agitation or concussion of the fat globules, and if the fat particles are separated by large volumes of serum, the chances of their being brought together to form butter granules are considerably lessened. It is a good plan, therefore, to make sure that the separator is giving a cream of reasonable richness—e.g., a test of 36 per cent. fat.

Lack of Proper Ripening of Cream.

For farm made butter, it is desirable to develop a certain amount of acidity or sourness in the cream. In other words, the cream should be allowed to ripen. Very fresh cream is more difficult to churn than older cream. The ripening process has the effect of reducing the viscosity of the cream and thus enables the process to proceed normally. Cream will usually ripen satisfactorily if kept at a moderately cool temperature of 70 degrees to 75 degrees F. for twenty-four to forty-eight hours. The safest way to control the ripening process is to add to the cream a culture of lactic acid bacteria or "starter," which may be obtained from the Department of Agriculture and Stock or from a neighbouring cheese factory.

Overloading the Churn.

A churn which is filled with too much cream will generally give trouble. Do not fill the churn more than one-third to one-half full with cream. This will give the cream more room to move, and hence the churning will be more effective. "More haste, less speed," is a maxim that will be brought home to one who tries overloading the churn.

Cream Too Cold.

Cream that is too cold is hard to churn. Temperatures between 60 degrees to 70 degrees F. are satisfactory for churning, but the more the temperature drops below 50 degrees Fahrenheit the more difficult will it be to make butter. In very cold weather, therefore, if the temperature of the cream falls too low, something should be done to warm the cream, either by adding small amounts of hot water to it or in some other convenient way.

Improving Churning of Stubborn Cream

Here are a few suggestions for improving the churning properties of stubborn cream:—

(1) Add some dry salt to the cream.
(2) Add small quantities of hot water to the cream.
(3) If possible give cows some succulent feeds.

(4) Ripen the cream; if it will not sour normally, obtain a lactic starter from the Department of Agriculture and Stock or from a neighbouring cheese factory.
(5) Separate the cream so that it is reasonably rich. A test of 36 per cent. is a good average one.
(6) Do not overload the churn.
(7) Do not churn cream at too cold a temperature.

Selecting the Dairy Heifer.

E. B. RICE, Dairy Branch.

CAREFUL breeding and selection, with due appreciation of production and conformation, is the keynote to success in dairy herd improvement.

Having regard to the cost of rearing a heifer until it becomes profitable, the necessity for careful and skilful selection is evident. Naturally, it is expected that any animal chosen for retention in, or as an addition to, a herd will grow into a mature cow of good constitution with a reasonable probability or her production being higher than, but at least equal to, the herd average.

In appraising conformation and type, the immaturity of the young animal should be given due consideration, but it should possess essentially the desirable characteristics sought for in mature stock. Briefly, the chief external characteristics used as a guidance in choosing a dairy heifer are:—

(*a*) It should possess good dairy form, especially evidence of feeding capacity, blood circulation, and mammary development
(*b*) It should be a healthy, growthy individual.
(*c*) It should be stylish and of good general appearance.

In utilising production records as a basis of selection, the farmer will have to exercise his own judgment, according to the herd standard, as to the milk or butter-fat yield required before the progeny of any cows will be retained and reared for herd replacements. The standard will be raised in succeeding years as the herd level rises. The retention in the herd of heifers from cows whose production is not less than 500 gallons of milk, or 200 lb. of butter-fat per lactation, should be the aim in an efficiently managed herd.

Pure Bred Stock

In the selection of a pure-bred heifer or calf, dairy type or conformation, coupled with pedigree, gives definite guidance. Good conformation will ensure that the heifer, if inheriting productive qualities, will develop into a cow possessing a constitution capable of standing up to the strain of milk secretion over a long number of successive lactation periods. Any weakness in constitution should be interpreted as a warning sign. Although a heifer possessing superior dairy conformation is undoubtedly likely to prove a better producer than one showing defects apparent to the eye, conformation itself cannot be taken as a reliable guide to

productive ability; investigations have shown that the chance of selecting by external features alone the highest producer among a group of cows, all of good conformation, is only about one in five.

The mere possession of a pedigree denoting purity of breed is, too, not sufficient evidence of suitability for retention for herd replacement. It is now well recognised that not only should the pedigree show that the animal is pure-bred, but also that she is descended from families which by actual records of productive ability have proved themselves. In the examination of a heifer's pedigree, the production figures of her nearest female ancestors on both the dam's and sire's sides are first noted; records of full sisters and other relatives, if available, are likewise reliable indicators of production tendency.

Grade Stock.

In choosing a heifer from a grade herd, reliance should usually be placed on the ability to discern from external features alone an animal which promises to develop into a satisfactory producer. In grade herds, in which the advantages of the grade herd recording scheme have been availed of, selection may be more reliably undertaken by using as a basis not only type, but, in addition, the production records of the herd. Production testing and its intelligent application, by placing breeding and selection on a constructive basis, is a matter of major importance in the grading up of an ordinary dairy herd.

CARE OF MILK AND CREAM.

Milk when drawn from the cow is usually of good quality, unless it has a weed or feed taint, or the farm water supply is stagnant or otherwise below the standard of quality required. Tainted or bad milk or cream is a general cause of the low quality of cheese and butter, which is so often recorded. If the question were asked, "Who or what is mostly to blame for the low grade of some dairy produce, the cows, the farmers, the cheesemakers, or the buttermakers?" the answer should undoubtedly be, "First, the farmers, then the cheesemakers and the buttermakers, and, lastly, the cows." There is, generally, no reason why cheese and butter should not be of good quality if milk and cream are properly produced and treated. From the factory point of view, it is impossible to make high-grade cheese and butter out of low-grade milk and cream. And it has to be acknowledged that factory management and equipment have attained high standards in Queensland, and that factory personnel, holding certificates of competency, are highly skilled. Therefore, as a general rule, it is reasonable to look to the dairy for causes of defects in milk and its products.

Carelessness in handling milk or cream is not, as so often claimed, due to ignorance, for every dairy farmer knows or should know how to ensure cleanliness in his dairy. It is a reasonable conclusion, therefore, that defects in dairy produce do not develop because of lack of knowledge but because of lack of good will. Carelessness, slovenliness, bad and dirty habits and customs in and around dairy premises are the primary causes of low quality in dairy products. If one dairy farmer can supply first-grade milk or choice cream with unfailing regularity, another farmer, surely, can do likewise! The main essentials of successful dairying are wrapped up in the one word—*cleanliness.*

—L. VERNEY.

WHEY ON THE FARM.

Whey as a stock food has become of greater importance as a consequence of the expansion of cheese production. The *Dairy Produce Act* specifies that whey must be effectively pasteurised at a cheese factory before its return to farmers. While primarily intended as an anti-disease precaution, pasteurising improves the keeping quality of the whey, and by retarding acid development minimises the risk of digestive disturbances in pigs and calves.

Because of transport restrictions, milk cans are often used for bringing whey back to the farm, but, if practicable, other cans should be used exclusively for whey. If, however, whey must be returned in milk cans, it should be emptied from the cans immediately on arrival back on the farm, and the cans thoroughly washed and scalded or steamed and inverted on a metal draining rack to dry and air. Sour whey, if left in cans, will soon remove the tin coating and cause rapid rusting.

Careful attention to the following points will ensure that whey will be a safe and attractive stock food:—

Scrupulously cleanse in the same way as with all other dairy utensils any drums or other vessels used to hold whey on the farm.

Keep whey in a *cool* place.

Cover the top of the vessel with hessian or board to keep out flies.

Never put fresh whey in vessels containing stale whey, or vessels which are not completely clean.

A pamphlet entitled *Feeding Whey to Calves and Pigs* is issued free of cost by the Department of Agriculture and Stock, Brisbane.

—E. B. RICE.

DAIRY ENGINEERING.

A chemical engineering survey of Queensland butter factories is being conducted at present by a chemical engineer attached to the Dairy Research Laboratory. The immediate object of the survey is to stimulate all possible economy in the operation of dairying plants in this State. Experience has shown that refrigeration and fuels are the most likely directions in which worthwhile economies are often possible.

Following the survey of butter factories a similar programme is contemplated in regard to cheese and milk factories. All such saving as can reasonably be made under the present difficult conditions will obviously revert to a direct saving for the milk and cream producer.

It is hoped, eventually, to establish a complete engineering section in the Department sufficient to advise on all engineering matters in the dairying industry, and at the same time to undertake research work along lines promising improvement on present day operating technique.

Any assistance required by dairy farmers in connection with their own problems, such as cooling milk or cream on the farm, water supply, &c., will be gladly given on writing to or calling at the Department of Agriculture and Stock, Brisbane, or a country centre at which an officer of the Dairy Branch is stationed.

—F. G. FEW.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society, Jersey Cattle Society and the Ayrshire Cattle Society, production records for which were compiled during the month of July, 1943 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORN			
	MATURE COW (STANDARD 350 LB.)			
Fairvale Ethel	J. H. Anderson, Southbrook	11,185·38	453·374	Blackland's Stately Major
	SENIOR, 4 YEARS (STANDARD 330 LB.)			
Alfa Vale Pansy	W. H Thompson, Nanango	16,870·7	723·584	Reward of Fairfield
	JUNIOR, 3 YEARS (STANDARD 270 LB.)			
Penrhos Bonnie 10th	A Sandilands, Wildash	6,275·82	281·783	Penrhos Pansy's Prince
	SENIOR, 2 YEARS (STANDARD 250 LB.)			
Rosenthal Choice 17th	S. Mitchell, Warwick	7,600·21	313·933	Rosenthal Perfection
Mountain Camp Reflection's Rosette	W. Caldwell, Bell	5,742·21	254·344	Trevor Hill Reflection
	JUNIOR, 2 YEARS (STANDARD 230 LB.)			
Fairvale Minerva	J. H. Anderson, Southbrook	8,542·77	318·867	Fairvale Czar
Trevor Hill Jeanette 2nd	Geo. Gwynne, Umbiram	7,856·32	308·753	Rosenthal Musketeer
Glen Idol Daphne 7th	Estate, P. Doherty, Gympie	6,821·7	293·634	Blackland's Count
Glen Idol Primrose 6th	Estate, P. Doherty, Gympie	6,850·55	270·833	Blackland's Count
Trevor Hill Crystal 2nd	G. Gwynne, Umbiram	7,248·82	269·564	Rosenthal Musketeer
Burnland's Dolly 2nd	J. E. Burnett, Brookfield	6,815·99	254·531	Blackland's Red Prince
Trevor Hill Lila 2nd	G. Gwynne, Umbiram	6,569·78	249·582	Rosenthal Musketeer
Tabbagong Ruth 35th (217 days)	J. Crookey, Allora	6,334·29	242·33	Parkview Consul
Penrhos Merle 10th	A. Sandilands, Wildash	5,498·25	234·204	Penrhos Pansy's Prince
Penrhos Evelyn 8th	A. Sandilands, Wildash	5,581·43	230·944	Penrhos Pansy's Prince
Trevor Hill Blanch (253 days)	G. Gwynne, Umbiram	5,917·84	230·626	Rosenthal Musketeer

The PIG FARM

Economy and Palatability of Pig Foods.

E. J. SHELTON, Instructor in Pig Raising.

TO produce pigs economically, recourse should be had to the use of as great a variety in the diet as possible, and a variety of foodstuffs should, as far as can be arranged, be produced on the farm. While the cost of the pigs' ration has to be kept in mind, consideration should be given to its quality, continuity of supply, and the palatability of the various feeds.

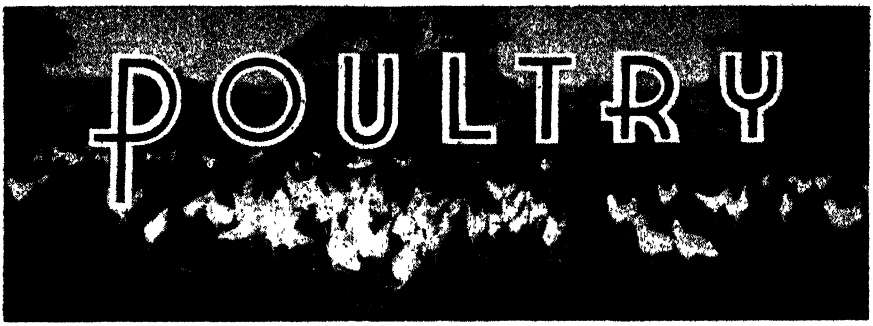
No foodstuff should be used, no matter how cheap or how palatable to the animals, if its use will detrimentally affect the quality of the resultant carcase. Peanuts, for instance, while most appetising and palatable to pigs of all ages, and productive of good growth averages, should quite definitely be omitted from all rations fed to pigs in preparation for market, otherwise the pork and bacon and other products will be unsaleable, being soft, oily, and carrying a very unpleasant (fishy) flavour. Even for small goods, oily pork is of no value, for, if used, excess of oil will ooze and drip and completely spoil their sale. Most people do not like fat meat, and they certainly will not appreciate soft and oily hams or bacon.

Again, what is suitable for one class of stock, or stock at a particular age, may not be suitable for all animals, and the methods of using stock food governs its relative value. For all producing animals, that is, animals which convert the food eaten into some direct product—progeny, milk, meat, wool, &c.—sufficiency of food is essential; therefore the ration should be appetising, nutritious, and easily digestible.

Unless the ration is palatable, the animals will not eat enough to make their feeding a profitable venture. Some bulky roughage, it is admitted, is necessary, and some foods somewhat unpalatable as a single item may be mixed with more palatable foodstuffs to build up a sound ration. Roughages should be fed with concentrates. In some systems of feeding, the addition of molasses is advised, although only in small quantities, for, if fed too liberally, scouring and digestive disorders may result. Molasses is purely a laxative fattening food containing no protein, but is nevertheless a very useful supplement.

Cost of Foods.

Purchased feeds for pigs should be economically priced; fortunately, it so happens that most of the food which the farmer may need to purchase is required in very small quantities, hence, per unit, may not be necessarily expensive. The subject requires careful study in order to avoid the production of animals at a rate that will not pay.



The Care of Growing Chickens.

P. RUMBALL, Poultry Expert.

THE age at which the chickens should be taken from the brooder depends largely on their growth, and the climatic conditions. Generally, the earlier chickens are taught to use the perch the better. In this position they obtain an air supply carrying the least fouling and do better. The first perches should be placed in the brooder house when the chickens are about 4 weeks old; this allows the chickens to use them throughout the day and makes weaning from the brooder easier.

With the colony brooder, it is easy to instal a light system of perching. The perches should only be about 6 inches above the level of the floor, with a ramp leading upwards. A good plan is to attach 1-inch-mesh netting under the perch and ramp. This will keep chickens off ground level, and allow ready movement from perch to perch. The netting should, however, be taut. If netting is unavailable, slats may be used, about an inch apart. In a few days time, the chickens will have become accustomed to the perches, and if development and weather are suitable, the brooder may be removed from the house. When this has been done, it is most important that those attending the chickens should be on hand at dusk to see that the chickens go on to the perches. They may have to be driven up and kept there until they have finally settled down for the night. There will be a crowding, but they will not use the perches only, most will be on the netting. Providing the crowding is not too close, no harm will follow as those underneath will still get air. This would not be so if they were crowding on the floor, and not upon netting, nor would the slats give the same protection. As the chickens grow older the perching arrangement may be gradually raised to the height of the ordinary hen roost. It is necessary to stress the need for attendance at dusk for some nights (three or four with light breeds and at least a week with heavy breeds) in order to make sure that the chickens do use the perch; in fact, on every occasion that an alteration is made in the system of perching, or when birds are removed from one house to another, it is necessary to make sure that the perches are used.

Segregating the Sexes.—The rearing of cockerels and pullets separately allows for different treatment, protects the pullets from bullying, provides more feeding space, and prevents crowding on the perches. Among the light breeds, segregation may be done at the early age of two or three weeks. The earlier it is done the better, if brooders or rearing houses are crowded. It should not be delayed any longer than

6 weeks. The male birds may easily be distinguished by the development of the comb and wattles, and the more rapid growth of wing and tail feathers. Those features may not be pronounced in slowly developing birds.

Development of the heavy breeds is much slower, and the males do not possess the domineering nature of those of the light breeds. It may be some months before the sex of all heavy breeds can be determined, but segregation should be practised as early as possible.

As the birds develop they require more room, air, feeding, and drinking space. This is provided to a considerable extent by segregation. For grown birds, at least one foot of feeding space should be allowed for each ten.

Grading.

The grading of both cockerels and pullets according to size is almost as important as segregation. The number reared in each clutch and the size of the buildings in which birds are being reared governs largely the feasibility of grading. Units of 100 are more satisfactory among layers, and the more rapidly the pullets can be reduced to this number the better. Although grading to size and development is suggested, the backward birds from one batch should not be placed with younger chickens. Grading of pullets will lead to uniformity of development, with fewer runts in the young flock. Where clean range is available it may be desirable to place the pullets in colony houses; otherwise it would be better to place them in the laying houses.

Feeding.

Pullets should be fed on a ''growing'' mash and grain, with shell or limestone and hard grit, charcoal, and water constantly available to them. If dry mash is fed, there should be ample feeding space—one foot for each ten birds is recommended. Feeding hoppers should be so constructed so that no food shall be wasted or fouled. When wet mash is fed to growing stock, it is advisable to give one full meal of mash early in the morning, and a smaller meal at mid-day. These meals should be fed at the same hours each day. In feeding grown birds, the general practice is to supply only the morning meal of mash. If this practice is adopted, it is essential that the mid-day meal of mash be discontinued before the pullets commence laying. Chaffed green feed or soaked lucerne chaff may be substituted at mid-day for the mash.

When ''growing'' mash is fed, it should be used until the pullets are about four months old, and then changed for ''laying'' mash. Should the change be delayed until the pullets have commenced laying, it should be gradual, taking at least one week to change over.

In general practice, the evening meal is made up of grain—wheat, maize, or a mixture of these cereals. If it is desired to make a change in the grain ration, this should be done before production commences, or if later, the change should be a gradual process, particularly when grains to which the birds are not accustomed are fed.

Irregular water supply will cause retarding of growth, or affect production; therefore, the pullets should have a constant supply of clean fresh water kept in a cool shaded place.

Pullets being reared in colony houses or temporary quarters should be moved to the permanent houses before they commence laying. The placing of pullets when about four months old in their permanent quarters gives them time to settle down before starting to lay. The

number in each unit is important, because pullets will grow more uniformly and their production will be highest when kept in units of not more than one hundred.

Vices and Ills.

In poultry raising, many vices may develop, and birds may become subject to disease and parasitical infestation because of lack of knowledge. Common results of ignorance or carelessness include:—

Toe Picking.—This is a vice of early life and may commence the first day in the brooder. Hunger, crowded conditions, feet abrasions, and inactivity may be the causes. The remedy is isolation of the toe-picked chicken, removing the offender if it can be found, inducing activity and so keeping the chickens busy. Of most importance is early action to prevent the spread of the vice. The toes of the affected birds may be painted with Stockholm tar.

Feather Pulling.—This bad habit may commence when the chickens are from four to six weeks old, and, if not corrected, may become fixed. It is difficult to correct when firmly established. Confined quarters aggravate the trouble, but it may be associated with malnutrition. Feather pulling frequently leads to cannibalism, as the plucking of the feather sometimes draws blood. Once fowls have acquired the taste for blood they become vicious in their attacks on others. Feather pulling may be checked to some extent by applying a stain to which bitter aloes has been added to the raw part. Providing occupation by frequent feeding of greens and reducing the number reared in any one group may also be effective. For fully grown birds, bran in mashes and plenty of steeped lucerne are suggested. Bran should be used in all chick mashes to the extent of 20 per cent.

Crowding.—Crowding into the corners of the brooder or rearing houses is caused by faulty management. The remedy is in the proper training of the chickens during the brooding stage, and afterwards when the growing birds are being "weaned" from the brooder, or when shifted from one house to another.

Lice, Mites, Ticks, and Worms.

External parasites are evidence of neglect to keep fowlhouses and poultry pens clean and to provide dust baths for the birds. Perches should be painted twice a year with creosote as a precaution against infestation.

Worm infestation is a result of under feeding or improper feeding, dirty runs, and other insanitary conditions—the remedy is obvious.

"CURLED TOE" OF CHICKENS.

Under normal conditions poultry rations contain sufficient riboflavine-rich foods to satisfy the requirements of poultry. Wartime restrictions of foodstuffs with consequent substitutions low in this vitamin have an important influence on the development of "Curled Toe."

This malady has been seen in chickens from two to twelve weeks of age. It is characterised by the sudden onset of leg weakness and curling-in of the toe of one or both feet. In the early stage the symptoms

are not readily seen, but if closely watched the birds will be seen sitting down more than usual, and on moving an intermittent lameness can be detected. In more advanced cases they walk on the hocks, and if forced to move more quickly adopt a hopping gait, making use of the wings to assist progress.

In other respects the chickens appear to be quite normal. Deaths are not common in the early stages.

The inclusion of leafy greens, bran, milk and livermeal, or raw liver in the diet gives very satisfactory results in the early stages. If, however, the disease has been left untreated it may progress to a chronic incurable stage, in which the bird remains permanently crippled. Spontaneous recovery sometimes occurs if the deficiency is not serious.

—P. RUMBALL.

BREEDING FOR EGG PRODUCTION.

In breeding poultry, the farmer should exercise the utmost care in order to establish and maintain a high-quality flock. Considerable progress has already been made in the improvement of breeding practice. Egg production has been increased from about 60 eggs to over 200 eggs per bird per annum, many individual pullets laying over 300 eggs in a year.

In dealing with the egg production in a flock of birds consisting of an equal number of pullets and hens, many authorities quote 12 dozen as a fair average annual production. It is doubtful, however, whether there are many poultry farmers in Queensland who obtain an average production per bird of less than 13 dozen eggs yearly. In some experiments conducted at the Animal Health Station, using White Leghorns purchased from a poultry farmer as day-old chickens, the average production over the two years was 181 eggs per bird, the variations being—pullet year, from 194 to 209 eggs; second year, from 155 to 162 eggs. In these experiments, 116 pullets were used, and the average of the two years was over 15 dozen eggs, and even these birds in their second year laid over 13 dozen. The birds were kept under poultry farm conditions.

The poultry farmer should be able to obtain an average production at least equal to those figures. A constant high average production is only obtainable by good breeding, in conjunction with good management and feeding.

The chief considerations in establishing standards of good breeding are:—Type, constitutional vigour, action, and laying characteristics. Having selected birds reasonably true to type, care must be taken to see that they are of strong constitutional vigour. This is indicated by the vitality, stamina, health, brightness, and alertness of the bird, and is of equal importance to the knowledge of the actual number of eggs laid. As an example, some years ago the first three birds in a laying test laid 302, 296, and 294 eggs, respectively. An examination of these birds at the conclusion of the test showed that the first and second birds were weak in constitution, whereas the third bird was very strong. All these birds were used as breeders, but while the progeny of the first and second hens were disappointing layers, the descendants of the third bird have performed very well in laying tests every year since. That example should emphasise very clearly the necessity for rejecting birds that are weak constitutionally.

Admittedly, it takes courage not to breed from a 300-egg bird. If such a bird produced the eggs without a heavy drain on her body she would be constitutionally strong. If, however, the bird rapidly loses condition during the year, she is obviously weak in constitution and, consequently, would probably be an indifferent breeder. Any bird that is unable to stand up to a heavy season's laying without losing condition cannot be expected to give high-laying progeny and should be discarded, irrespective of other characteristics.

—P. RUMBALL.

ANIMAL HEALTH

Milk Fever in Dairy Cattle.

J. C. MAUNDER, Veterinary Officer.

THIS is a peculiar disease of milk cows in which there is a partial or complete loss of consciousness, paralysis of the hind quarters and sometimes paralysis of other parts. Strictly speaking the disease is not a fever, the general condition is usually the very reverse of feverish.

It is most frequently observed in heavy producing cows whose milk is rich in butter fat. Animals in good condition liberally fed are more often affected than those reared under opposite conditions of management. It is commonest between the third and fifth calving and cows which have suffered from milk fever are liable to a recurrence at subsequent parturitions. It is more common following an easy birth although this rule has many exceptions.

Milk fever may occur either before or after parturition, but the majority of cases take place three to four days after calving. It has been known to occur up to four weeks after parturition.

Cause.

It is now generally accepted that the condition is brought about by a drop in the calcium content of the blood.

Symptoms.

The animal first shows signs of excitement. She may paddle with her feet and bellow. She may stagger, lose balance and fall to the ground. Efforts to rise are generally fruitless. A characteristic attitude is commonly adopted, the cow lying on her brisket, hind feet spread out almost at right angles and the head turned over one shoulder (often the left) and the muzzle pointing to the stifle. In this position she may snore or groan. In the later stages, the animal may be stretched out on her side. In no circumstances should attempts be made to drench the animal while she is on the ground.

Treatment.

The most recent treatment is the use of calcium borogluconate, which is inoculated under the skin. Two and one half (2½) ounces are dissolved in ten (10) ounces of boiled water which has been allowed to cool to body temperature. This material may be kept on hand for use as required. A syringe and a needle to fit is necessary.

The site for inoculation, behind the shoulder, should be clipped free of hair and the underlying skin swabbed with tincture of iodine.

An earlier and usual method of treatment is the inflation of the udder with a teat syphon and a pump. This milk fever apparatus may be obtained through pastoral supply merchants.

Internal Injury in Cattle, Caused by Foreign Bodies.

A F. C. OHMAN, Veterinary Officer.

THE swallowing of a sharp foreign body (described as traumatic pericarditis) picked up either from the pastures or when foods, such as bran mash, are given to cattle, in which a nail or piece of wire may be found, because of carelessness or by accident, is not an infrequent occurrence.

Cattle ingest food directly without mastication. In these circumstances, a piece of wire can easily pass with the food down the gullet into the paunch and honey-comb stomach. The danger is particularly likely, when small sharp bodies, such as nails, are swallowed. Larger sized bodies with smooth surface usually cause no trouble to the animal.

The foreign body when passed to the honey-comb may remain there for a time without causing ill-effects. Sooner or later, however, it becomes embedded in the wall. Increased straining at urination, or at time of parturition or abortion, may be regarded as a predisposing factor, which together with the contraction of muscles of the honey-comb wall, may readily fix the foreign body in the wall. The consequences of this will depend on the direction of insertion. Frequently, the nail or piece of wire cuts through one fold of this stomach and lies parallel to the wall, and fixed in this position causes no harm to the animal. Should it be placed more vertically, however, the affection becomes more severe. The foreign body gradually perforates the honey-comb and its further passage may be directed into the abdominal cavity; it may injure the liver, spleen, or, what is more common, may perforate the diaphragm and heart sac, threatening the heart directly.

The condition is not recognised easily, as the symptoms vary in proportion to the damage done by the foreign body. In some cases, it runs an insidious course—the animal losing condition, getting easily tired when driven, and suffering periodical digestive disturbances without any apparent reason. In acute forms the symptoms are more noticeable. The appetite becomes lessened and capricious, the rumination depressed and accompanied by a certain degree of bloat; diarrhoea may follow, the faeces being fluid and dark coloured, due to the pressure of blood, and often bad smelling. This condition may be followed by constipation. The milk yield usually ceases. A marked loss of condition also is evident. The animal frequently lies down and moans; this is also observed when the animal is getting up or being driven down hill. Sometimes a cough accompanied by groaning and also respiratory disturbances may be observed, indicating involvement of the lungs.

Treatment.

As the condition is usually hopeless, no treatment is advised. Early recognition of the trouble is of paramount importance, as the stockowner may get some return by early admission of the beast to the abattoir. It is advised that in suspicious cases veterinary advice should be sought with the view of early diagnosis of the condition.

Bloat in Cattle.

J. C. MAUNDER, Veterinary Officer.

BLOAT is a condition which occurs frequently in ruminants, particularly in cattle, and is often the cause of loss of the affected animal if the treatment is delayed. Cows in poor condition and especially after a period of feed shortage are more predisposed to the condition as they readily ingest large quantities of food, when the paunch and other stomachs are too weak to work with maximum efficiency. This foodstuff, remaining for a good while in the paunch, begins to ferment, leading to a high concentration of gas, which distends the paunch and the honeycomb stomach and the animal begins to show signs of pronounced distress. A large variety of foodstuffs may cause the condition. Ingestion of readily fermentable food, grass cuttings, immature shrubs, decaying vegetation, potato stems and leaves, beetroot or cabbage leaves (if in large quantities), grazing on pastures carrying mainly clover, trefoils (particularly during or after rain), poisons of vegetable origin, nightshade, sorghum, blue couch, and a number of other poisonous plants may cause bloat in cattle.

The disorder in most cases arises suddenly and runs an acute course. At the beginning, the affected animal may not show any sign of sickness. Soon, however, as the pressure on the diaphragm, lungs and heart by the distended paunch is continually increasing, the animal begins to show general malaise, arched back, "colicky" pains, switching of the tail, groaning and lying down. The appetite is decreased, rumination suspended, eructation and regurgitation may occur. The left flank and, as the condition advances, also the right one, becomes considerably distended. Respiratory disturbance is more evident, the respirations are hurried, accompanied by moaning, the eyes prominent and glassy, the pupils dilated, the head is kept low and distended. Finally, if no treatment is applied, the animal falls down and dies in convulsions simply from asphyxia.

Treatment.

In the early stages of the disease, the passing of a probang down the gullet into the paunch may relieve the animal and, secondly, cause the removal of the obstruction in case of "choking." Epsom salts, to which ½ oz. formalin has been added, may be given this way as a drench. Also other measures may be attempted, such as the manipulation of the tongue and throat to cause eructation, a stream of cold water applied over the back and abdomen, and massaging the paunch which will stimulate its action and reduce the concentration of the gas. It is also beneficial to place the animal in such a way that the fore part is elevated, e.g., by the placing of the fore limbs in the feeding trough. This will relieve the pressure on the heart and lungs.

If, however, these measures are, for some reason unpracticable, or the condition has gone too far when marked symptoms of asphyxia are manifest, the only thing to do to save the animal's life is the use of an ordinary trocar inserted over the left flank into the paunch to liberate the gas. Care should be taken to let out the gas gradually, as rapid emptying of the paunch may result in death of the animal.

Stock Poisoning Risks.

MONTGOMERY WHITE.

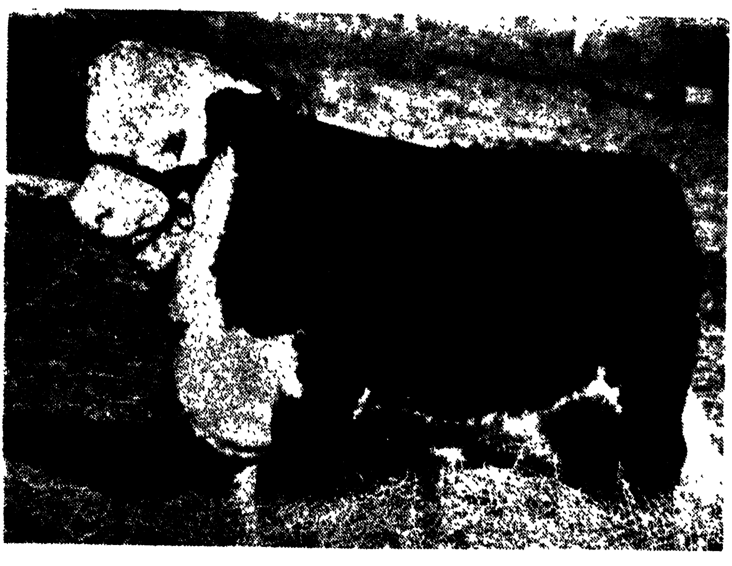
FAR too many cases of arsenical poisoning among livestock are recorded each year. Most of these end fatally. The tragedy of it all is that these losses can be avoided.

At present, when so many of the hands who used to do the mixing of arsenical preparations are on active service, it is worth while recording for the benefit of those taking their places, the main sources of arsenic poisoning.

Drums, buckets, and tins used for measuring or preparing dipping ingredients should be marked in some distinctive way and carefully placed out of reach of all stock. All left-over arsenic should be labelled and returned to the store or shed. Dips or sprays should be securely fenced off so that, no matter how thirsty stock may be, they will be unable to break into the fatal drink. All arsenic, whether white, grey, or pentoxide, is so poisonous that degrees of toxicity do not matter much.

An idea of the arsenic danger may be gleaned from the following instance:—An owner poisoned some diseased trees. Months later, he admitted stock which ate the fallen leaves. Severe losses followed. When timber or weeds have been poisoned, livestock should be kept out of the paddock, at least until a fire has been through and rains have fallen. In no circumstances should stock have access to pools of water formed in freshly poisoned country.

This brings us to the last precaution to be emphasised: See that the excavation into which discharged dipping fluid is pumped is as securely fenced off from stock as the dip itself.



[*By courtesy, Queensland Country Life.*

Plate 46.

WOODLANDS SAMSON.—Junior Champion, Brisbane Beef Cattle Show, 1943, the property of E. E. D. White.

[*See article on p.* 186.

The Brisbane Beef Cattle Show.

THE beef cattle show held at Brisbane, 16th to 18th August, brought record entries. Attendance was good, the judging facilities better than ever, and bidding for classing animals spirited.

Prize winners in all classes were splendid specimens of the breeds. In fact, it would be difficult in any show to have paraded better animals than the prize winners in the senior horned Hereford class. But the tail was present.

Lack of attention because of man-power difficulties and an adverse season—in Queensland at least—were partly to blame for the rough condition of many tail-enders, but poor conformation and unsound constitution have their origins elsewhere. Uneven top lines and too much daylight between bottom line and ground level were noticeable. Even among the older classes many beasts were not sufficiently well let down, and this accentuated the appearance of legginess. A marked all-round improvement in the "set in" of the tail and stream lining of neck into body was obvious. The Shorthorns throughout conformed more to the Scottish type—the hinds being particularly good in this respect. There is still, however, a tendency to pack too much on, in the regions of the less valuable cuts.

The Angus cattle showed two distinctive types—the big-framed, growthy type and the low-set, chunky, "light cuts" type. They were well turned out, and it was disappointing that more buyers were not present.

In past years the soft-handling, mellow hides and sleek coats which come from well-balanced rations containing variety and quality foodstuffs, particularly linseed, were a feature of these shows. This year, all the skill of the grooms and studmasters was taxed to the utmost to "make do" with available foodstuffs and yet produce show animals. Results were a credit to all concerned. There is no doubt that, despite minor faults in preparation, good lessons have been learned.

The incongruous deposits of quickly laid down fat were absent; the "swampy" almost "poddy" appearance that "pap" feeding produces was absent in the youngsters, and most of the bulls old enough for service were turned out in good firm paddock condition, without being either "hard" in appearance or pampered. Most owners were well enough aware of the fodder position in Brisbane and brought their own feed.

It seems truly remarkable that year after year such a collection of able studmasters should meet to exhibit, discuss breeding programmes, compare progress, and buy sires, and yet give feeding a miss—and feeding should be an integral part of their programme.

[By courtesy, Queensland Country Life.

Plate 47.

HOBARTVILLE RINGMASTER.—Champion Hereford Bull, Brisbane Beef Cattle Show, 1943, the property of P. Reynolds.

[By courtesy, Queensland Country Life.

Plate 48.

BOOROOMOOKA LEADER.—Champion Aberdeen-Angus Bull, Brisbane Beef Cattle Show, 1943, the property of H. G. Munro.

[*By courtesy, Queensland Country Life.*

Plate 49.

GUNDIBRI STANDARD 32ND.—Champion Poll Shorthorn Bull, Brisbane Beef Cattle Show, 1943, the property of J. T. Scrymgeour.

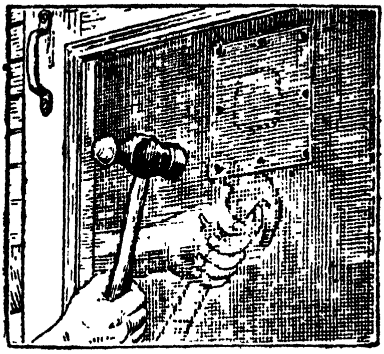
[*By courtesy, Queensland Country Life.*

Plate 50.

TURANVILLE CORONET 71ST.—Champion Shorthorn Cow, Brisbane Beef Cattle Show, 1943, the property of H. C. and J. C. Taylor.

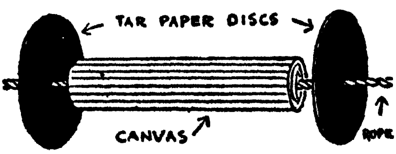
GADGETS AND WRINKLES

SCREEN DOOR PATCH.



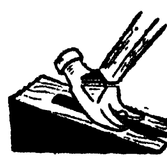
Torn screens in windows or doors can be mended with little effort by ready-made patches equipped with lead fasteners. Select the size patch that will cover the break, press the pointed lead "buttons" into the mesh with the fingers, and then pound them with a hammer to make them grip the wires. If the screen is in place, a brick or another hammer may be used as a pounding surface.

STORING BINDER CANVAS.

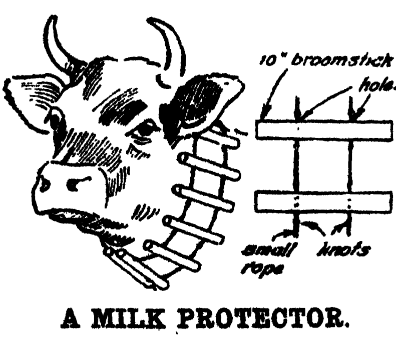


When the time comes to store the binder or combine canvasses be sure to put them where the mice cannot get at them. A very simple and effective way to do it is to thread the canvas on a rope with a tar paper disc at each end. Mice will not crawl beyond this barrier.

SLOTTED WEDGE NAIL PULLER.

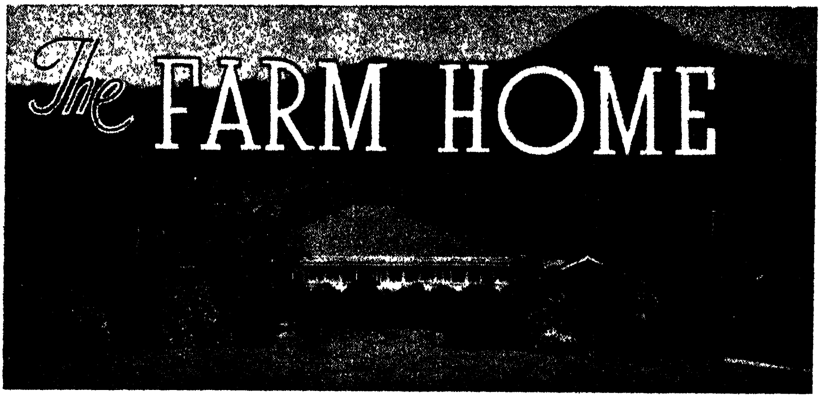


A great improvement over the common practice of using a scrap of wood to push under the hammer head when pulling nails is a slotted wedge-shaped block of hardwood. The block can be pushed under the head to suit the length of the nail.



A MILK PROTECTOR.

Here is a suggestion for breaking a cow of sucking herself: Take a series of round sticks and bore two holes in each stick a short distance from each end. Run a small rope through the holes, knotting it on either side of each stick to hold the wood in place. Place this rope "ladder" around the cow's neck and tie the rope ends.



Care of Mother and Child.

Under this heading is issued each month an article, supplied by the Department of Health and Home Affairs Maternal and Child Welfare Service, dealing with the welfare and care of mother and child.

BABY'S HEALTH: NATION'S WEALTH.

IN discussing constipation in babies, it is necessary to distinguish between two conditions—(1) hard motions and (2) infrequent motions—for the treatment is somewhat different.

The Breast-Fed Baby.

The breast-fed baby is never really constipated, and by that is meant that he does not pass hard motions. But he may pass a motion infrequently—say at intervals of 48 hours, or even longer. The motion, when passed, is usually quite normal. There is no need for a mother to become upset about this condition, and there is certainly no need to give opening medicine.

It is a good plan, provided the baby does not fight against it, to hold him out each morning after he has had his bath and a good kick. The sister at the Welfare Centre will demonstrate how this should be done without discomfort to either mother or baby.

Once or twice a day baby should be allowed to lie without his clothes, or with only a singlet, and exercise his legs and abdominal muscles by freely kicking—for 15 or 20 minutes in warm weather. Do not leave him on the bed to do this or he may fall off. If he lies on a cot mattress, or even a thick rug, he should be quite safe. In hot weather particularly, he should have a few spoonfuls of cool boiled water between meals; and he should, of course, be regularly fed. If a baby does not respond to this treatment, think of what he has to drink, and as most of this comes from his mother, it has to be considered whether she is eating the foods which will cause her milk to contain all that is necessary for baby's health. A lot is heard about vitamins nowadays, and one of these—vitamin B—which is specially associated with the general "tone" of the body and helps to keep the bowel muscle as well as all other muscles in good working order. Nursing mothers need an extra supply of this vitamin, and so, as well as eating no white bread, but always wholemeal or wheatgerm bread and porridge and plenty of vegetables, the mother should, if baby's bowels do not move regularly, take one or two tablespoonfuls of wheatgerm in her food every day.

The Bottle-Fed Baby.

Bottle-fed babies need the same treatment—regular feeding, kicking and water between feeds, but with them the condition of constipation is more troublesome, for cow's milk, either fresh or dried, can cause the motions to become very firm until they are passed as a solid mass or in small round lumps like pebbles. The food

may be wrong, and you will be wise to consult the sister at the nearest Welfare Centre about this, as babies cannot all be fed alike and may need a little more fat or a different kind of sugar, or a variation in the strength of their foods.

As giving mother vitamin B will not help in this case, giving it direct to baby may be tried. Add 1 teaspoon of wheatgerm (this is usually sold under trade names such as Cerevitamin, Bemax, or Vita B) to 2 tablespoons of boiling water. Allow this to soak for two hours, then strain through muslin and give the baby one or two teaspoons daily. He may have his orange juice in it if he likes it better that way. Marmite or vegemite, the size of a pea, may also be given to supply this vitamin. Dissolve it in a little warm boiled water and give before the 1 or 2 p.m. feed.

If, however, the condition is of long standing, it may be necessary to give some opening medicine. Standardised paraffin and milk of magnesia are the only aperients which may be used for an infant without medical advice. Whichever is chosen, much depends on the way the medicine is given. If too large a dose is given, or if it is given every second day, or once or twice a week, the irregularity of the bowels is increased, and the constipation may become chronic. The medicine should be given every day at exactly the same time, say a few drops morning and evening, and gradually increased if necessary, until a daily regular action of the bowels is established. Once the bowels are moving regularly, the dose should be very gradually lessened, at the same time continuing with the corrected feeding and the vitamin B preparations. Nothing else should be necessary.

The Toddler.

Sometimes babies become a little constipated after weaning when they have changed over on to more solid food. This can be easily overcome by giving oatmeal or wheatmeal jelly as a porridge instead of barley or rice or other refined porridges, and by increasing their sieved vegetables. Constipation in the toddler is usually a matter of correcting the diet—although it may sometimes be caused by wrong management. Mothers become over anxious about the child's bowel movements and are inclined to fuss or panic if he does not have a motion every day. Nothing could be worse, because a child will sometimes refuse to pass a motion because of the consternation he produces, and he likes to cause a sensation. Sometimes, indeed, a child is so bribed, coaxed or even bullied by an anxious parent that every time he is put on his chamber he makes a scene, kicking and screaming and holding himself rigid. Mothers should never show a child that they are anxious he should pass a motion daily: it should be taken for granted that he will, that it is usual for small boys and girls to do so, and that anyway it is a matter of little importance.

With proper management and the right diet, including wholemeal bread and porridge and a proper amount of vegetables and fruit, constipation should be very uncommon.

Questions on this and any other subject concerning Maternal and Child Welfare will be answered by communicating personally with the Maternal and Child Welfare Information Bureau, 184 St. Paul's Terrace, Brisbane, or by addressing letters "Baby Clinic, Brisbane." These letters need not be stamped.

IN THE FARM KITCHEN.

The Makings of a Square Meal.

Mutton Broth.—1 lb. neck of mutton or mutton bones, 1 tablespoonful chopped parsley, 1 teaspoonful salt, 1 tablespoon barley or rice, pepper, 1 onion, 1 pint water. Wipe meat; chop bones into small pieces, put meat and bones into a saucepan, cover well with cold water, allow to stand for 30 minutes, place on the fire; add onion, salt, pepper (if available), and washed barley or rice; simmer for 2 hours; remove meat, bones, and fat; add chopped parsley, boil for 2 minutes; serve hot.

Neck of Mutton and Barley Stew.—2 scrag ends, or 2 lb. neck of mutton, 4 tablespoons barley, carrots, onions, other root vegetables if desired, flour for thickening, 1½ pints of water. Chop neck of mutton into convenient pieces; place with barley in large saucepan in cold water; bring slowly to the boil and simmer gently for 1 hour. Then add vegetables, salt to taste; simmer for another hour; thicken before serving. Potatoes may be placed on top of the stew and cooked with the same fuel.

Vegetable Stew for Children.—Partly fry a large onion and put into a casserole with several potatoes cut into thick pieces, chop a turnip or parsnip into dice and add some peas—any that are cooked and left over will answer. Season with salt, pepper, and barley; cover with water. A slice or two of bacon may be added, or a few slices of mutton may be put in just to heat, but not to boil. Pearl barley could be used instead of peas, about a quarter of a cup, and it must be soaked overnight. Cook for 2 or 3 hours until it is rich and savoury. Stock or milk may be used instead of water.

Stewed Flat Ribs or Flap from Forequarter of Mutton.—Flat ribs (and the shank as well may be used), 2 onions, salt, and pepper, a bunch of herbs, if liked, 1½ level tablespoons flour, ½ lb. green peas. Cut the mutton into pieces about 2 inches square. Cut away excess fat. Put the sliced onions and herbs into a saucepan with about three-quarters of a pint of water (one and a half breakfast cups). When boiling, add the meat and a little salt and pepper. Allow to boil a moment, and then simmer gently until the meat is tender—two or two and a half hours. Add the shelled peas after the first one and a half hours. When the meat is tender, lift it out and thicken the stock with a little flour blended with cold water, stir till boiling, and boil two or three minutes. Return the meat to the pan, season to taste, and thoroughly reheat. The peas may be cooked separately and added to the stew just before serving.

Breast of Lamb Stuffed and Baked.—Take ½ lb. breast of lamb, 3 oz. breadcrumbs, 1 oz. suet, 1 teaspoon mixed herbs, 1 dessertspoonful chopped parsley, salt, pepper, grated lemon rind, a little milk.

Remove the bones from the meat. Make a seasoning of the breadcrumbs, chopped suet, parsley, herbs, grated lemon rind, pepper, and salt, and bind all together with a little milk. Spread the seasoning down the middle of the meat and make into a roll. Tie this round securely, cover the outside with any odd bits of fat, and bake in a moderate oven with a piece of greaseproof paper over the top. Remove the paper ten minutes before serving. Serve with mint sauce.

Skirt Steak and Savoury Potatoes.—Take ½ lb. skirt steak, ½ lb. potatoes, 1 large onion, small piece of butter, milk, pepper, salt.

Boil the potatoes in salted water with the onion. When cooked and drained put through a coarse sieve. Have ready in a saucepan a little milk, butter, and pepper. Have the liquid very hot, and add the potato mixture. Stir over the heat. Melt a little butter or dripping in a frying pan and brown each side of the steak. Make some gravy after the meat is done by adding a little water, pepper, salt, and a dash of any bottled sauce. Stir and cook for a few minutes. Put the potatoes round the edge of a flat casserole and rough up with a fork. Place the meat and gravy in the centre and put into the oven for about fifteen minutes to brown. Before serving spread a little butter over the steak, also a few drops of lemon juice, and sprinkle with chopped parsley.

Plain Suet Pudding.—One pound of flour, ½ lb. of suet, 1 teaspoon of baking powder, 1 small teaspoon of salt. Chop the suet finely. Sift the flour, baking powder, and salt together, mix in the suet, and pour in enough milk or cold water to make a limp dough. Put into a scalded and floured pudding cloth (leaving room for pudding to swell) or into a pudding basin and cover loosely with pudding cloth, or with buttered paper, and boil for 1½ hours. Serve with treacle, sauce, or golden syrup. It is better to use cerevite or wholemeal flour instead of white flour in these puddings.

A. H. TUCKER, Government Printer, Brisbane.

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Contents

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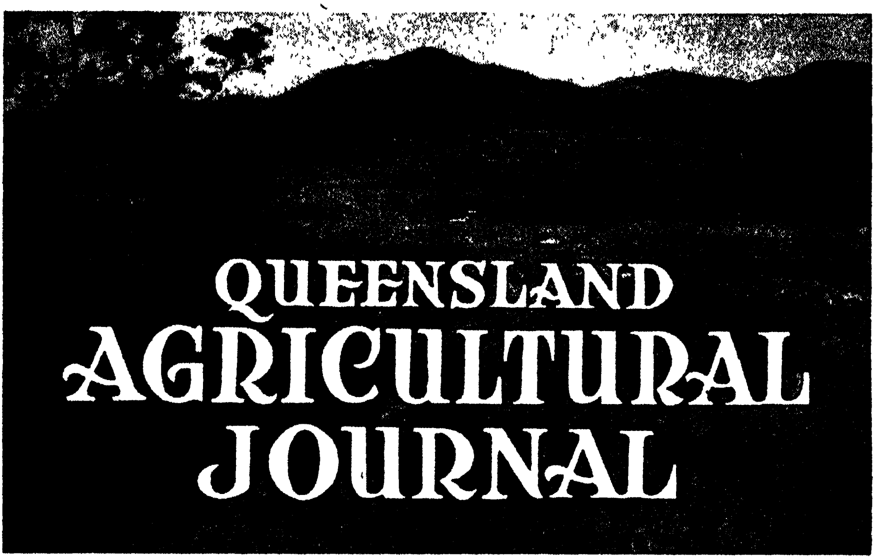

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Event and Comment.

Primary Production in Queensland.

THE general pastoral and agricultural situation is reviewed in the Annual Report of the Department of Agriculture and Stock for the year ended 30th June last. Following is a brief summary of the main points of the Report:—

The statistical position of the pastoral industry as on the 1st January, 1943, is indicated in the following livestock figures:—Sheep, 25,150,000; cattle, 6,400,000; horses, 450,000; and pigs, 315,000.

Although wool and fat sheep values were satisfactory, there was little demand for store sheep. Weekly sale yardings of fat sheep were sufficient to meet requirements and quittances were satisfactory to the producers. There was an increase in fat lamb deliveries, most of which showed evidence of type and quality and correct marketing age, and, therefore, that producers are breeding and fattening on proper lines. Fat lamb raising is now an expanding practice in districts other than the Darling Downs and the production prospects of this important branch of the pastoral industry have improved commensurately. Merino breeders are continuing to improve flock standards. Merino stud establishments also are increasing in number and should have a gradually extending influence on the maintenance of the reputation of the State for the production of high quality Merino wool. The health and condition of flocks are good. The increase in the price of wool has added to the stability of the industry and strengthened confidence in its future. Investigations into animal diseases and diagnostic work were somewhat limited as the result of calls made on the veterinary staff for war duty. Prevention rather than cure has always been the aim, and this is all the more essential because of present national food requirements.

Production of raw sugar for the 1942 season was 605,615 tons. Cane harvested totalled 4,350,487 tons, thus 7·18 tons of cane were required to produce 1 ton of sugar—a value exceeded only once in the last fourteen years. The average price of sugar was £18 13s. 11d. per ton, compared with £17 18s. 4d. for the previous season's output, and the value of the crop was, therefore, approximately £11⅓ million.

Cotton acreage was reduced because of adverse climatic conditions at the normal planting period. The importance of increased cotton production and cotton seed oil and meal has induced farmers with suitable conditions to include cotton-growing in their cropping plans.

Wheat grain prospects were very promising early in the season, but the dry period which followed retarded crop development. Because of further set-backs from rust infestation and hail and frost damage, the yield for the year did not exceed 4½ million bushels. Maize crops yielded well and the grain generally was of high quality. The cultivation of grain sorghums is expanding rapidly, especially in districts where the occurrence of rain at the right time for maize is uncertain.

High yields of summer grain and root crops were obtained. To meet a rapidly increasing demand greater attention has been given to the production of potatoes and other vegetable crops, particularly in the Northern districts. An interesting development was the successful winter production of potatoes in the Ayr and Mackay divisions, which relieved heavily-taxed transport from the South.

Summer sorghum crop reservations provided good grazing of particular value in supplementing the pastures for both sheep and cattle. Other summer fodder crops, including lucerne, were in abundance, but because of the general shortage of farm labour, conservation was not practised as extensively as in former years. Tobacco production was below the average of recent years, chiefly because of lack of labour for planting and harvesting.

Every effort was made to supply an extraordinarily increased demand for fruit and vegetables. The production of vegetables as near as practicable to centres of consumption has resulted in large scale production in North Queensland, both on the coast and tablelands. In other parts of the State vegetable production also has greatly increased. The output of the Granite Belt region is particularly important, since the crops mature in mid-summer, when production from coastal farms is limited. Plans are being made for a further increase in acreage for the coming season. Pineapple and citrus growers also are contributing greatly to the national war effort by increased production and extension of processing facilities.

Dairy production for the year was the highest for any year since the war began, notwithstanding the fact that a large quantity of milk had been diverted to fulfil Army contracts. Increases in the retail prices of butter and cheese, together with a Commonwealth subsidy, have led to the economic stabilisation of the dairy industry. Cheese production has expanded in a period of two years to about two and a-half times the pre-war output, constituting a record for Queensland, now the highest cheese-producing State in the Commonwealth. The war-time contract entered into by Britain with Australia for the purchase of all Australia's exportable surplus dairy produce was renewed.

Saccharine Sorghums.

C. S. CLYDESDALE, Senior Instructor in Agriculture.

SACCHARINE sorghums are characterised by succulent stems, the juice of which is distinctly sweet and contains an appreciable amount of sugar.

The seed of the saccharine sorghums has frequently a rather bitter flavour, with an astringency which is absent or less noticeable in most of the varieties of the grain group. This, however, does not prevent stock from eating the seed readily.

As fodder, the saccharine sorghums are not only much more nutritive, but usually they provide a greater yield of green fodder than do most of the grain sorghums. The leaves and stalks are very palatable, and are readily eaten by all kinds of stock. Analyses show that the nutritive ratio of the saccharine sorghums is wider than that of green maize. The lower percentage of digestible crude protein in the saccharine sorghums demonstrates maize to be the more valuable stock food, since, to obtain a desirable balance, more fodder or concentrate rich in protein has to be added to the former. The superiority of maize also is supported by the fact that it can be fed at any stage of growth, while saccharine sorghums should not be fed before the flowering stage because of the risk of poisoning when fed at an earlier stage of development.

Saccharine sorghums, however, have the advantage that, on fertile soils, they produce a crop at least as heavy as maize and produce better yields on the poorer soils than maize is capable of doing. They also preserve their succulence to a greater degree and for a longer period than does maize after being frosted. In the form of either fodder or silage, saccharine sorghums are a valuable feed for dairy cows, especially if fed with a legume in either the green feed or the hay stage. Saccharine sorghum silage is also an excellent standby for very dry conditions, not only as feed for working stock, but also for maintaining condition on the other farm animals. The easy digestibility and the moisture content of such silage are particularly valuable under such conditions as preventives of impaction, which is frequent in cattle and sheep when they can get only dried up, coarse, and fibrous grasses.

Varieties.

In Queensland, a great many varieties of saccharine sorghum have been tried out. Only the following few, however, have been extensively grown.

One of the oldest and, until recently, the most popular variety is Planter's Friend or Imphee. It stools well, has stout stems and large leaves, and grows to a height of from 6 to 10 feet. It is very sweet and succulent. The heads are large, compact, and erect, and the seed is brown. It is valuable either for feeding as green fodder when mature or for silage.

A more recent introduction is Saccaline, which has become the most popular variety within the past 20 years for green fodder and for silage making. It reaches maturity in about the same period from sowing as Planter's Friend. Its stems are medium large, with abundant leafage, and grow from 6 to 10 feet in height. The heads are large, compact, slightly drooping, and carry a large quantity of seed. The seed is reddish in colour, with short dark-red or black glumes.

Plate 51.

SUGARDRIP.—A promising new saccharine sorghum.

Seed of the Honey variety was received from the United States Department of Agriculture in 1923 and tested out over a number of years in the Northern and Central Districts of this State. In the far North, it eclipsed all other varieties in yield in comparative trials, and it is now a very popular variety in that part of Queensland. It is a tall-growing variety, sometimes attaining 12 feet in height, and is characterised by the possession of longer stem internodes than other varieties. Honey leaves are large and the heads are loose, open, and erect, with much less seed than is the case in Saccaline. The seed is reddish-brown and is almost completely enclosed by shining dark-red glumes. This variety is commended for its succulence, sweetness, and low fibre content, which is associated with the length of the internodes. It takes from 110 days to 130 days to reach maturity.

Good results have been obtained with other varieties, such as White African, Sugardrip, Orange, Italian, and Sumac. Colman is a promising new saccharine sorghum, and Atlas is a dual purpose variety.

Mixed Crops or Sorghums and Legumes.

Sorghums for silage may be grown with a summer growing legume, such as a suitable variety of cowpea or velvet bean. However, there are considerable objections to this procedure, and it cannot be recommended as a general practice in Queensland, although on the Atherton Tableland it may be adopted with some measure of success. Experience shows that generally larger yields will be obtained when the crops are grown separately and then mixed when filling the silo. Furthermore, separate crops present less difficulty in harvesting than does a mixed sorghum and legume crop.

Plate 52.

Colman.—Another new saccharine sorghum.

Where Sudan grass or other fine-stemmed sorghums are sown for feeding off or for haymaking the inclusion is recommended of early maturing varieties of cowpeas, such as the Black in the southern districts and Groit in the northern Tableland areas. The cowpea should be sown broadcast, using 10 to 15 lb. of the Sudan grass with 4 to 5 lb. of the cowpea per acre.

Rotations With Sorghums.

Sorghums are sometimes considered to deplete the fertility of soils excessively, as non-leguminous crops following sorghums frequently yield less than normally anticipated. Other theories have suggested that the sorghum roots, during the growth of the plant, secrete a substance that is toxic or slightly poisonous to the following crops, as evidenced by the light, yellowish-green leaves of such crops, especially on soils that normally have a low nitrogen content, or on various types of soils in dry seasons.

Plate 53.

SACCALINE.—The most popular of the saccharine sorghums.

Investigations in the United States of America indicate that the reductions in the yield of non-leguminous crops following sorghums are mostly due to the depletion of the nitrate nitrogen by the sorghum crop and to the amount of sugars in and near the crown of the sorghum plant. These sugars may be so concentrated that soil micro-organisms attempting to decompose them and the old sorghum roots during the period when the following crop is growing compete with that crop for the nitrates present, thus further reducing the supply of nitrates available for the crop following the sorghum.

Sorghums should, therefore, be grown in rotations in which either an inoculated legume is grown after the sorghum crop, or in which the land is ploughed as soon as the sorghum is harvested, or grazed off and is then left as a moist, bare fallow until the roots are properly decomposed before some other non-leguminous crop is sown. Both procedures should provide ample amounts of nitrogen for following non-leguminous crops, if the nitrogen content of the soil were satisfactory before the growing of the sorghum crop. Generally speaking, unless the soil is very fertile, it is advisable to follow a sorghum crop with a legume, after which any crop, other than cotton, may be grown before again growing sorghum.

Poisonous Properties Of Sorghums.

All of the sorghum varieties can possess more or less poisonous properties up to the flowering stage, because of the presence of a prussic-acid-yielding glucoside. Young growth, stunted growth, or growth that has been frosted before flowering is regarded as particularly dangerous. Wild sorghum is dangerous throughout its whole life. Sudan grass, when pure, is often grazed at all stages of growth without ill-effect, yet there are instances of serious losses having occurred thereby. Great care should be exercised in feeding or depasturing any variety of sorghum before the flowering stage has been reached. The degree of danger depends, however, largely upon the rate of growth, the plant being most harmful when growth has been interrupted or delayed by unfavourable conditions.

SUGAR CANE AND ITS CULTURE.

Volume IV.—Sugar Cane and Its Culture—of the Queensland Agricultural Handbook Series is now out of print. Consequently, no further copies are now available.

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Volume I.—Farm Crops and Pastures (5s., post free); Volume II.—Horticulture (4s., post free); and Volume III.—Insect Pests and Plant Diseases (3s., post free) of the Handbook Series are still available and are obtainable at the prices stated on application to the Under Secretary, Department of Agriculture and Stock, William Street, Brisbane.

Navy Bean Production.

J. A. KERR, Instructor in Agriculture.

SUBJECT to the availability of equipment for mechanical harvesting, including modern threshing machines, and also to the provision of centrally-situated grading facilities, the production of navy beans for canning should become an important enterprise in the South Burnett.

Among the reasons why this crop should establish itself in favour are:—

1. The short season from planting to harvest (approximately 3 to $3\frac{1}{2}$ months).
2. Average net returns with favourable weather, which should be from £10 to £15 to the acre, with higher returns probable.
3. Cropping sequence—January will probaby be the most favourable planting month, permitting the previous establishment and first cultivation of normal maize and peanut crops.
4. The beans do not shatter freely nor readily weather stain, unless prolonged wet weather is experienced.

Soils.

Experience during the past few years indicates that the principal qualification of suitable soils is reasonably good fertility. High yields have been obtained on soils varying from sandy loams to chocolate soils, including a large range of red loams, but planting on poor soils is not recommended.

Soil Preparation.

Soil preparation should be in accordance with normal cultural methods designed to conserve moisture and produce a medium fine seed-bed.

Planting.

Late December to the end of January is the most suitable planting period. January planting should permit crop maturity during April, when harvesting weather should be generally favourable. Moreover, January planting should fit in with other farm crop operations.

The application of superphosphate should generally be beneficial. Planting is usually done with a maize planter with a row spacing of from 2 feet 8 inches to 3 feet. When peanuts are grown on the same farm, a similar row spacing is used to facilitate row cultivation. Approximately 12 lb. of seed of navy beans to the acre are required, with average plant spacings of from 4 to 6 inches in the row. Because of the late planting, rarely more than two and frequently only one row cultivation will be necessary.

Harvesting.

Harvesting may be delayed until most of the pods are almost dry. Shattering has not been of any serious consequence in the South Burnett during the past three seasons.

The use of the bean cutter which cuts two rows at a time and diverts them to one central windrow will probably be the usual method of harvesting during the next season, although the pea attachments to the header-harvester may prove useful for the work. Where the header-harvester is not to be used on the windrows, the beans are usually placed in small cocks to complete drying. They may be then threshed in the field or conveyed to haysheds awaiting the arrival of suitable threshing machines. Threshing machines designed to handle wheat or cowpeas are suitable. Peanut drum threshers will thresh the beans. Further grading may be necessary to produce top grades.

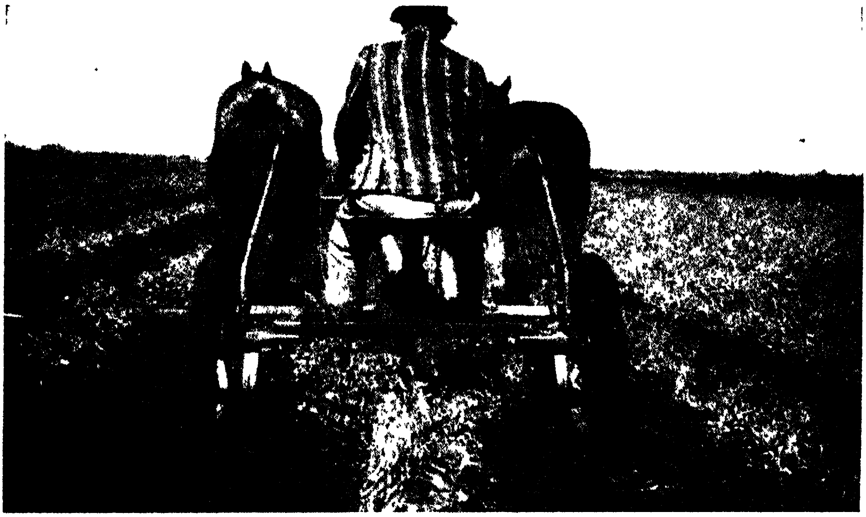


Plate 54.
A two-row bean cutter.

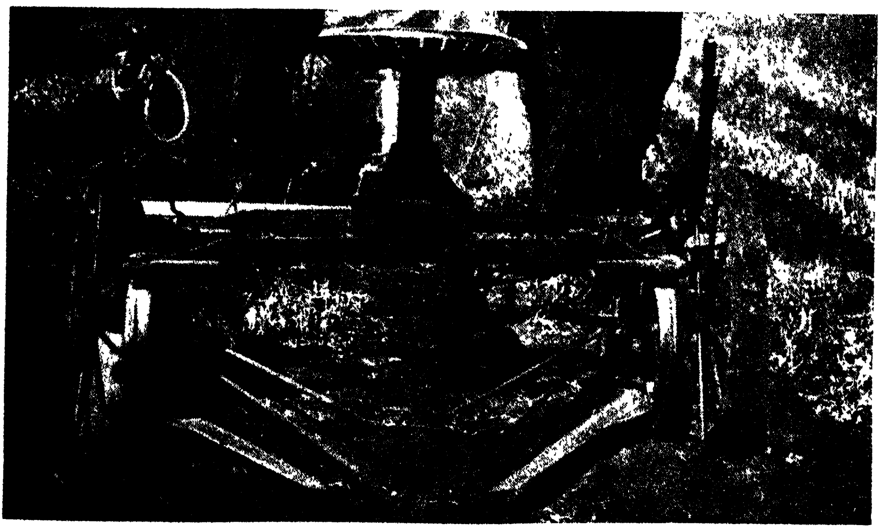
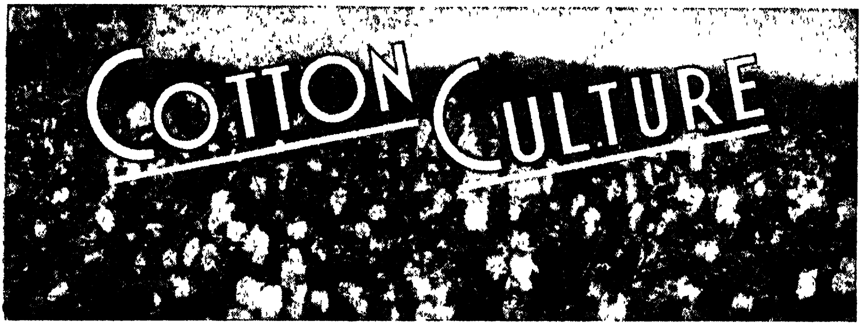


Plate 55.
A close-up view of a two-row bean cutter, showing cutting blades and guide rods for placing bean plants into a single windrow.



Breeding Jassid-resistant Cotton Varieties.

S. MARRIOTT, Assistant Research Officer.

IN the article on cotton breeding, which was published in the September number of this journal, mention was made of the programme of work which is being conducted in this State in order to develop jassid-resistant varieties. Herein follows a description of this work, which not only shows what improvements have been made, but also serves to illustrate with actual examples how the three main systems of breeding described in the previous article, namely, mass selection, individual plant selection and hybridisation, have been used in this problem.

In this, as in most similar projects, it must be understood that all three methods may be employed simultaneously. It is to be expected that, if a variety contains individuals with the desired characters, mass selection of these types will result in a rapid improvement of the variety up to a certain point beyond which, however, further progress is slow. Individual plant selection of superior types in the variety will lead more slowly to a still further degree of improvement in it, while hybridisation may result in the production of a strain comparatively close to the plant-breeder's ideal, which, in this case, is a strain of cotton with desirable plant and fibre characters together with an extremely high degree of jassid resistance, if not immunity.

It was found in Africa and India, where jassids are also serious pests of cotton, that whenever really resistant plants were found, they always exhibited the character of leaf hairiness. Unfortunately, however, not all hairy plants are resistant, because if this were true, the isolation of resistant strains would be simple. The problem is further complicated by the fact that, under some conditions of soil and soil-moisture, plants which may be either hairy or quite hairless also appear unaffected by jassid, and it is only by growing their progeny under conditions of heavy jassid incidence that their resistance or susceptibility may be demonstrated.

The symptoms shown by a susceptible plant during a jassid attack may be described briefly as first a curling down of the leaf margins, followed by a discolouration of the leaf margins from green to yellowish-green, then to bronze-green, and finally to a red colour. On examination of the under surface of the young curled leaves, the small pale yellowish-green jassids may be observed. They move in a characteristic sideways fashion. A badly-affected plant may cease all growth and flower so early in its development as to result in a poor yield being obtained.

was possible to use selection methods in the problem of develop- jassid-resistant cotton in Queensland since it had been observed that, some varieties, and in Miller in particular, occasional resistant plants occurred in jassid-infested fields. Initial studies of these plants and their progenies revealed that in some cases the resistance was inherited and this preliminary work developed into the actual individual plant selection phase of the problem. As certain strains showed remarkable uniformity for resistance in their first generation as separate progenies, it was unnecessary to adopt mass selection methods, until a heavy attack of the spur-throated locust destroyed a large seed increase plot of the most resistant strain, leaving only a small residue of seed. This loss made necessary the use of the more rapid but less efficient method of selection already mentioned under the name of mass selection.

Mass Selection.

As the chief character desired in the new strain was jassid resistance, a field of Miller 41 cotton heavily infested with jassids was inspected, and the seed from all apparently resistant plants with the exception of those showing major deficiencies in other characters, such as very small bolls or very short lint, was bulked. This mass selection yielded sufficient seed to plant five acres in jassid country, where unfortunately only a mild attack was experienced, making re-selection impracticable. As a whole, however, the plot was uniformly, hairy, and seemed to be showing less leaf curl than the nearest crop of commercial Miller grown on similar soil. The seed from the plot was therefore bulked, and in the following season, i.e., 1942-1943, about 100 acres of the strain were grown, and good yields of satisfactory fibre were obtained. Studies of the plant population showed that the strain was distinguishable from commercial Miller by virtue of increased plant hairiness—a significant sign. This strain, which is known as 41J, is most heterogeneous, however, as is to be expected from its origin, and is not considered to show any more than a 20 per cent. increase in jassid resistance. A fresh mass re-selection which has been made should yield an improvement in resistance. Losses from jassid may be so severe in some districts, however, that the bulk stock of 41J seed produced in 1942-43 wil be released for commercial planting, as the strain may reduce, to some extent, the losses sustained through jassid attack.

Individual Plant Selection.

Individual plant selection was commenced in the 1938-39 season, and the Miller strain 111-26, originating from a single plant selection, has been remarkably jassid-resistant, while in addition it has exhibited marked uniformity in all seasons for plant and lint characters. This uniformity decreases the chances of obtaining further superior types from it, but also guards against deterioration through segregation into undesirable types during the period of multiplication of the seed to commercial proportions. In strain trials, as well as in multiplication plots, it has shown great freedom from jassid injury and good yielding ability. During last season the strain produced seed cotton which was graded into a 15/16-1 inch staple length, while the fibre strength and body were classed as very good. The fibre is coarse, and this may indicate its ability to produce a strong lint even under adverse climatic conditions. About 10 acres of this strain will be planted in the coming season, and in addition numerous re-selections will also be grown. This

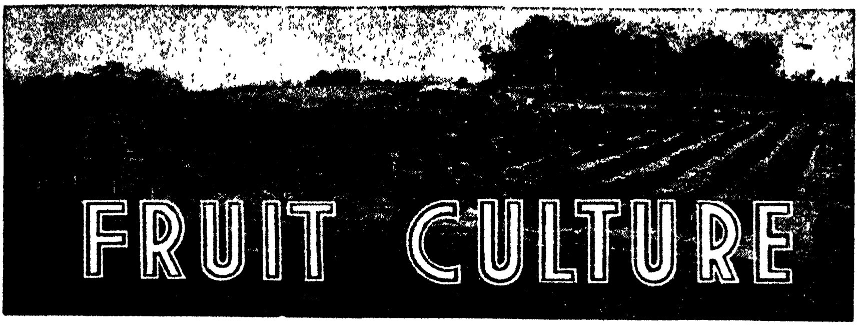
strain, however, bears only a medium-sized boll, and also produces a rather leafy type of plant. Since, as mentioned above, the high degree of uniformity makes it improbable that these defects can be corrected by selection, the search for other pure strains is continuing. Of all the primary selections made from Miller and grown in plant to row plots in the search for these improved resistance strains, about 25 per cent. have survived in the form of re-selections, and some of these families appear promising as their plant habit and ginning percentages seem to be improvements on the two main resistant strains so far isolated.

Hybridisation.

The hybridisation method was also incorporated in the breeding programme because it was found that all imported jassid-resistant cottons have been useless from a commercial point of view, although they often possessed a very high degree of resistance. This has amounted to practical immunity in the case of the most recent introduction, which is the Ferguson variety kindly made available by the geneticist of the Empire Cotton Growing Corporation's Cotton Research Station in Trinidad. This project was planned as a relatively long term one and as the objective was the transfer of the main character of resistance to Queensland commercial cottons, the back-cross method was adopted. This method involves making the initial cross between the selected commercial variety and the resistant introduction, while each subsequent hybrid generation is crossed back to the commercial type, care being taken to ensure that only those hybrids which exhibit resistance are used as parents. If the back-crossing is continued for a sufficient number of generations, the resultant hybrid will be practically identical with the recurrent parent, with the addition of the character transferred to it from the other parent—in this case resistance. By subsequent individual selection of resistant plants satisfactory strains, combining resistance and suitable plant and fibre characters, are eventually evolved.

The variety chosen as the recurrent parent was Miller, it being the most extensively grown variety producing good quality lint and adapted to a wide range of conditions. The resistant parent used was the South African variety U4 or a U4 derivative. The Ferguson strain already mentioned may supplant the U4 strains in this work. It has been found that the first generation hybrid seems intermediate between both parents for such characters as boll size and ginning percentage, while its jassid resistance is as high as that of the resistant parent. On the other hand, the first back-cross generation—*i.e.* (Miller x U4) x Miller—approaches quite close to the Miller type of large boll and strong fibre, while selected plants also retain a high degree of jassid resistance. Three such strains, after some years of simple plant selection, show sufficient uniformity in quality, resistance, and yielding ability to warrant their being increased for adequate testing. Third back-crosses—*i.e.* {[(Miller x U4) x Mi] x Mi} x Mi—and fourth back-crosses which have been made should be even more valuable and less variable, but their establishment on a commercial scale will require some years of work.

From the above outline of the progress made in this project it should be evident that it has been sufficiently satisfactory, in developing promising jassid-resistant strains of the Miller type of cotton, to warrant its expansion to include some other varieties. Accordingly, the New Mexico Acala and Triumph varieties have been crossed with the Ferguson variety as the first step in evolving jassid-resistant strains of these two important cottons.



A Wireway for Bananas.

H. BARNES, Director of Fruit Culture.

AN endless wire system on the flying-fox principle for conveying banana bunches from the plantation to the packing-shed will save time and much hard work. Such a system also would be useful on any hillside orchard.

Briefly, the idea of the system is to despatch fruit by gravitation from a central point in a plantation to the packing-shed. The system is of simple construction, as shown in the illustrations. With round-grooved wheels, the carriers run on an endless wire, so that as one is despatched to the packing-shed with a load its weight pulls the other up to the point of despatch for another load. Installation of the system is not difficult, but its efficiency in operation must obviously be based on its structural strength. On very steep grades a simple breaking system will regulate the speed of the loaded carrier.

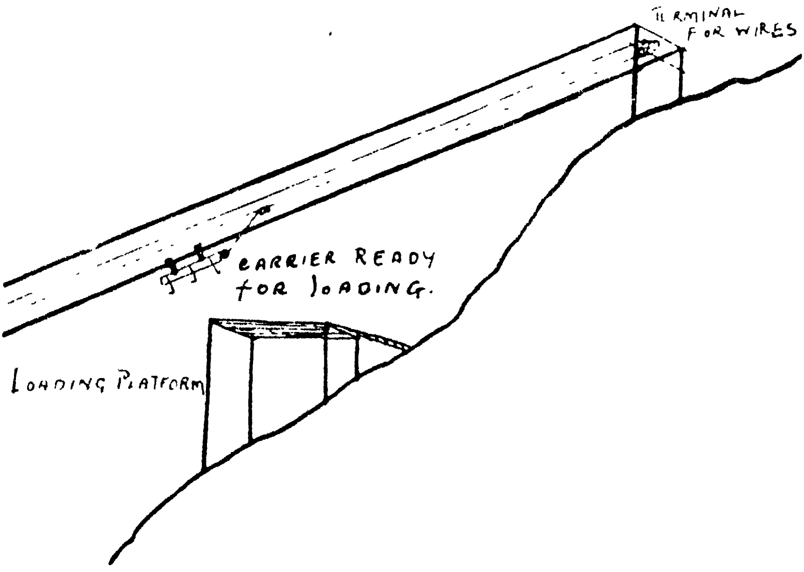


Plate 56.

An Endless Wireway for Conveying Banana Bunches from the Plantation to the Packing Shed.

A central site on the plantation should be chosen as a convenient despatching point and, of course, a lower site at the packing-shed as a receiving station. A suitable place for the loading platform would be on the top of a rise, so that the wireway would be high enough for the banana bunches on the carrier to clear the banana plants when in transit. The site of the receiving terminal should, of course, be suitable also for the building of a packing-shed with easy access to a roadway. On some slopes there may be some difficulty in obtaining sufficient height for the wireway, but this may be overcome by building stagings at both the despatching and receiving points, as illustrated (Plate 56).

Construction of the System.

Details of construction are shown in Plate 57. The main posts marked A at both top and bottom terminals must be solid and about 12 feet long. They should be firmly fixed in the ground, at least 4 feet deep and preferably 5 feet, and should be well braced. In the sketch the posts at the despatching end are shown anchored to a convenient stump for additional strength. The distance between the posts at each terminal may be about 6 or 8 feet.

About 6 inches from the top, bore inch-diameter holes through each of the posts for the carrier wires (B). The holes in the posts at the top end should be inclined downhill and those through the bottom posts inclined uphill, so that the wires when strained will not kink at the entrance to the holes. A straight pull also makes it easier to strain the wires, which should be drawn as tightly as possible. To do this, tie the wires firmly round the posts at the sending end, and at the receiving terminal wind the slack of the wires round good strong rollers (C). If wooden rollers are used, they should be made of tough cross-grained timber, 4 inches in diameter, clear of sap. Straight-grained timber is liable to split and is not capable of carrying the load. Iron levers, ¾ inch to 1 inch diameter (D), passed through holes bored at right angles to one another in the ends of the rollers will give a good purchase and enable the wires to be tightly strained. For the carrier wires, heavy 10 by 12 gauge oval steel wire (if now obtainable) is sold specially for the purpose. This wire has a breaking strain of 2,140 lb., and is suitable for all ordinary distances up to approximately 600 yards. Some systems in use are a mile long, but heavier wires are, of course, required for them.

For the endless wire (K), 12 by 14 gauge steel wire is generally used. This runs round grooved wheels fixed at each terminal.

Posts marked E are sunk and well braced at the receiving terminal. If a good anchorage such as a stump is not available at the despatching end, similar posts should be erected there also. Cross bearers (F) made of 4 by 3 inch hardwood to carry the wheels are then bolted across the posts. Care is necessary in fixing the bearers, as in order to prevent the wire running off the wheels they must be tilted slightly, the wheel at the top being inclined downhill and that at the bottom uphill. In Plate 57 it will be noted that at the sending terminal the top bearer is placed across the front of the posts, and the posts are checked out to allow the bottom edge of the bearer to be completely housed in the posts. The lower bearer is placed across the back of the posts, and in this case the posts are checked out so that the top edge of the bearer is completely housed. A piece of solid hardwood is next bolted to the top of the bottom bearer to form a small platform (G), so that when a hole for the axle of the wheel is bored through the top bearer the auger will

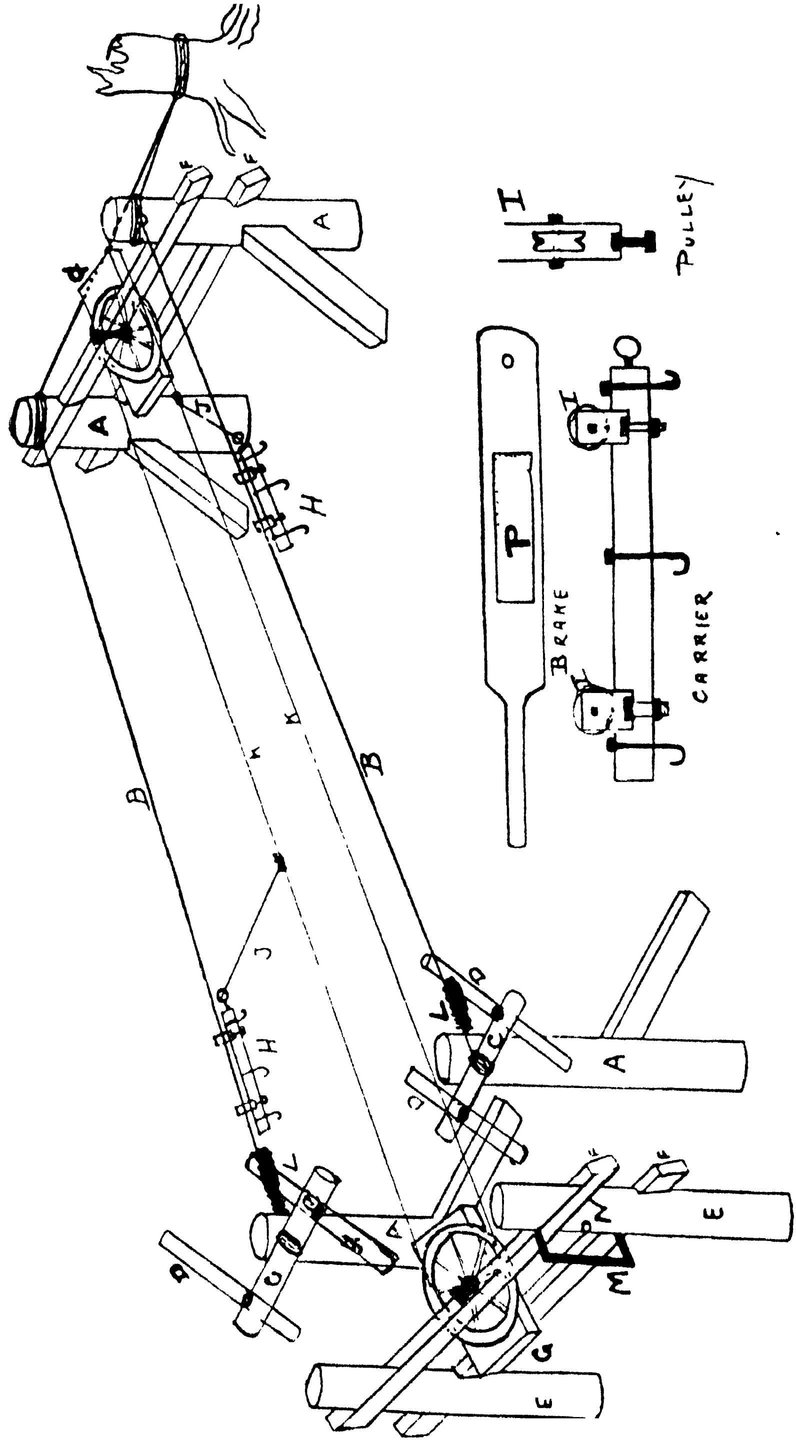


Plate 57.
SKETCH SHOWING DETAILS OF WIREWAY CONSTRUCTION.

continue on and bore a corresponding hole in the platform for the other end of the axle. The wheel, when fitted, will then be inclined towards the wheel at the bottom terminal, where a similar procedure is followed to tilt the wheel uphill. Old motor cycle or motor car wheels serve the purpose very well.

The endless wire, when fitted, should be fairly tight, otherwise it will tend to run off the wheels. The approximate length required should be measured and run round one of the wheels while the latter is in position, and tied with a piece of tie wire to prevent it slipping off. The other wheel should then be lifted out of its platform and brought forward several feet. The wire should then be placed around it, and the two ends tied. The tie should be strongly made. The wheel is next drawn back to its correct position on the platform, and the axle inserted to hold it in its place. The use of a Spanish windlass, made with a rope and two or three pulley blocks, is an easy way of drawing the wheel back into place. If facilities for making a Spanish windlass are not available, the wheel with the endless wire tied on may be strained through a post fixed behind the terminal posts (E) in the same manner as the carrier wires are strained. If the wire is still not tight enough, the join will have to be broken, the wire shortened, and the work done again.

Construction of Carriers.

The frames of the carriers (H) are made from pieces of hardwood measuring about 4 feet long by 3 by 1 inches. Holes are bored as shown for the hooks from which to hang the bunches. The pulleys (I), if otherwise unobtainable, can be made by a good blacksmith. The pulley frame is usually $1\frac{1}{2}$ by $\frac{1}{4}$ inches iron bent as shown. Through the bottom a $\frac{3}{8}$-inch hole is bored for a bolt to fasten the pulley to the carrier. A second $\frac{3}{8}$-inch hole is bored through the two sides for a steel bolt to serve as an axle for the pulley wheel, which may be an ordinary grooved wheel of about 2 inches diameter. The pulley wheels should be frequently and liberally oiled. A small hole bored through the pulley wheel above the axle bolt will be found of considerable benefit. The pulley frame is partially housed in the wooden frame of the carrier, as shown, by mortising out a piece of the wood and then bolting right through. At the end of the carrier, a hook to which to tie the tail rope (J) is screwed in. The carrier is fitted on the wire (B) by removing the axles for the pulley wheels, fitting the wire in the pulley frames, and then replacing the wheels. The tail ropes should be long enough to allow for a sag in the carrier wires when carrying a load, and they should be firmly fastened with the wire to the endless wire to prevent it slipping. Also, if one tail rope is tied to the join in the endless wire, the latter will not be required to run round the wheels, and the tie will therefore not cause any obstruction. It also is a good idea to fit a swivel in the tail rope, near where it is tied to the endless wire, to prevent the tail rope from twisting round it. At the bottom terminal of each of the carrier wires, a piece of wood (L) about 2 feet long wired on will act as a stop to hold the carrier when it arrives with its bunches, and prevent it from bumping the posts and bruising the fruit.

The Brake.

The brake is made from a piece of solid hardwood fashioned with a handle like an elongated cricket bat. It should be loosely fastened with a long bolt to one of the bottom posts at the point "N." For extra strength a piece of iron (M) may be bolted through the post to form a

D, through which the brake is inserted. The brake should be only loosely bolted, as it must be capable of being moved forwards and backwards, according as it is pressed against the wheel to check its speed or released to allow the wheel to spin faster. A piece of leather (P) tacked to the face of the brake where it comes into contact with the wheel will increase its efficiency.

Strawberries in North Queensland.

W. G. HANCOCK, Fruit Branch.

THE strawberry is a plant of the temperate zones. While with suitable treatment it may make good growth, and flower and fruit during the cooler autumn, winter and spring months in North Queensland, the summer there is too hot for it, and plants in the field deteriorate after fruiting and usually die out or produce weak spindly runners. The main reason is the extremely high surface temperature of the soil, which to a low growing and shallow rooted plant is particularly detrimental. Therefore, local runners for planting in autumn are usually weak and poor, while stock brought from the South has the disadvantage that its origin is unknown.

Plant Selection.

Strawberries show wide differences between plants of a variety, in respect of quantity, quality, size and type of berry and other points. This may be seen in most plantings from runners selected haphazardly. Since vegetatively reproduced plants follow closely the characteristics of the parent, whether good or bad, it is quite important to be very critical in selecting only desirable strains. This, of course, applies everywhere, but the method of growing for the tropics about to be described shows the necessity of it in a very practical way.

Soil.

This method is to plant on ridges, reasonably wide and flat at the top, centred 2 feet 6 inches apart, and the plants set 16 inches to 18 inches in the rows. Very early in March is the usual time. The most suitable soil is a good light loam, which should be carefully prepared and well manured. If possible, animal manure should be used together with some superphosphate, otherwise a complete fertiliser; but strawberries do best when ample humus is present in the soil.

Irrigation.

Irrigation is essential, and water should not be stinted. The water may be run into the furrows so that the plants are not actually wetted, but so that the soil around the roots will have ample moisture. When it is necessary to work amongst the plants—for example, when picking—each alternate furrow may be filled turn about, so that there is always a dry furrow to walk along. If it is necessary to apply fertiliser during growth; a water-soluble mixture may be thrown in small quantities into the water. If the ground is clean and has been well prepared, weeds should not cause trouble during the comparatively short period of growth and cropping.

Planting Points.

While the crop is on and the plants can be judged for their productivity, all which are outstanding for the quality and quantity of their fruit can be marked with a small peg, and these, or at least a sufficient number of them, may finally be kept for production of runners. Cropping finished, these plants are lifted and set out on the level in a well-prepared and manured nursery bed in a cool situation. The remainder of the patch can then be destroyed. The nursery bed should not be heavily shaded, but should have a southern aspect and be lightly shaded from noon onwards. Thus the plants will be spared the afternoon sun. Under these conditions at least eight runners can be counted on each plant, so that the number of selected parent plants need not be more than about one-eighth of the total area intended to plant next season. The bed, therefore, can be kept small and manageable, permitting frequent watering and weeding as required, since it is essential to keep the runners growing well. The result will be fine sturdy plants for setting out in the autumn, probably already with several crowns.

This method has been practised at Townsville for many years, and the results have been extraordinarily good. These results are considered to be due partly to the annual selection for fruit quality, and partly to maintaining vigour by holding and propagating the planting material in a cool well-tended nursery bed during the hot summer. The method of planting on ridges and watering by furrows seems to have outstanding advantages for North Queensland.

Pests and Diseases.

A few pests and diseases are almost certain to occur, and these should be attended to both in the nursery bed and after planting out. Mites cause a withering of the foliage and are controlled by dusting with sulphur. Aphids and thrips should be sprayed with nicotine sulphate and soap. To keep leaf spots under control, spraying with Bordeaux mixture both in the nursery bed and in the field up to flowering time is advisable. A watch should be kept for the virus disease Yellow Edge, and any plants affected immediately destroyed.

Picking.

As a final hint, it may be remarked that there is a lot of hand work with strawberries, and while they are not hard to grow they require a lot of attention; conversely, they soon exhibit the effects of any neglect. It is wise, therefore, to restrict the area to what may be readily handled. Even from a small heavy-bearing plot a useful return may be taken, as strawberries almost always command a ready sale locally. Picking should be done preferably in the morning as soon as the dew is off, when the fruit can be picked straight into trays or punnets.

CHANGES OF ADDRESS.

Subscribers are asked to kindly notify changes of address to this Department without delay.

Vegetable Production

NEW METHOD OF SEED EXTRACTION.

The following information has been supplied by the Commonwealth Council for Scientific and Industrial Research:—

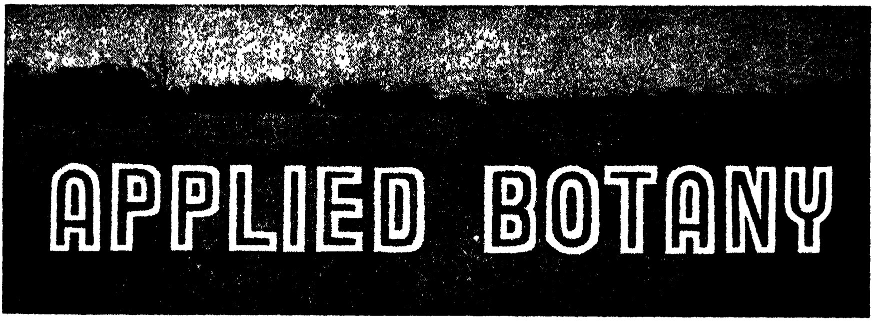
In Australia and the United States of America, the usual method of tomato and cucumber seed extraction involves the fermentation of pulped well-ripened fruit for 24-48 hours in order to free the seed from the pulp. This process is time-consuming, and is not always entirely satisfactory.

An officer of the Division of Plant Industry, C.S.I.R., has discovered a simple and inexpensive new method which overcomes many of the disadvantages inherent in the old method of seed separation by fermentation. The principle of the new method is to add commercial hydrochloric acid (muriatic acid) to the pulped fruit after which the seed is washed out in the usual way. Tomatoes should be pulped in a wooden barrel or galvanised iron container painted inside with quick-drying bituminous paint, as the acid attacks galvanised iron. Cucumbers are mechanically crushed before placing in the container or are cut lengthwise and the seed-containing flesh scraped into the container, the skins being discarded. The pulp should be well stirred while the acid is acting. If any difficulty is experienced in incorporating the acid into the mixture, the acid can be diluted with about twice its volume of water before mixing with the pulp. After one hour the seed can be washed out in the usual way.

With tomatoes the acid is added at the rate of 1¼ gallons per ton of fruit, which is equivalent to 62 ccs. or one-tenth pint per box of 25 lb. of fruit.

With cucumbers, where the whole fruit is crushed for seed extraction, the same quantity of acid used with tomatoes is satisfactory. Where the seed-containing pulp only is used, 2½ gallons acid per ton of pulp which is equivalent to 125 ccs. or one-fifth pint per 25 lb. of pulp is needed. The cost of acid per ton of pulp is in the vicinity of 4s. with tomatoes and 8s. with cucumbers, buying acid in 3-gallon jars.

Apart from the considerable saving in time, the new method has the advantage of producing a brighter, cleaner seed sample, which is free from all traces of pulp. Germination is not adversely affected in any way, but is rather improved because of the absence of traces of flesh which carry mould spores and other organisms which interfere with germination, and which can cause disease in the plant. Fruit at all stages of ripeness can be treated with equal success, so that fruit can be picked and processed as soon as it is ripe. Seed yields tend to be higher with the new method, as a better extraction is obtained. It is possible to treat tomatoes or cucumbers and have the seed dried and bagged the same day.



Edible Trees and Shrubs.

2. BROAD-LEAVED SALLY WATTLE.*

W. D. FRANCIS, Botanist.

THE wattles are leguminous trees or shrubs which are widely dispersed in the warmer parts of the world. The different kinds are most strongly developed numerically in Australia and Africa.

The Broad-leaved Sally Wattle is a common tree in Eucalypt forests and in cleared scrub or rain forest. The trees growing in cleared scrub or rain forest appear to originate from seed carried from the neighbouring Eucalypt forests.

The trees as most commonly met with are bushy types from 15 to 20 feet in height. The bark is generally brown in colour and deeply wrinkled or fissured. The leaves are situated alternately to each other on the branchlets; they are often sickle-shaped in outline, taper at each end, are finely veined lengthwise, and measure from 3-6 inches in length. The flowers are in globular heads and are pale yellow in colour. The pods when ripe are strongly coiled.

The species is widely spread from Atherton and Herberton in the north to Stanthorpe in the south. It penetrates inland in the south to Wandoan, which is about 180 miles from the coast. It occurs also in New South Wales and Victoria.

The leaves and green twigs are readily eaten by stock in dry periods. For this purpose the trees have been lopped or cut down. Destruction of trees is not usually recommended, but in this instance the trees are mostly short-lived. The stems are attacked by boring insects, which eventually kill the trees. Many coastal species of wattle, which form regrowths in felled areas, are subject to the attacks of borers in this way.

* *Acacia implexa.*

NOTICE TO READERS.

Because of the present necessity for strict economy in the use of paper, readers are requested to renew their subscriptions promptly. If renewals are unduly delayed, it may be impossible to supply back numbers of the Journal.

Address all renewals and other correspondence to the Under Secretary, Department of Agriculture and Stock, Brisbane.

The Varieties of Tonga or Tongan Bean Cultivated in Queensland.

C. T. WHITE, Government Botanist.

ONE of the most popular home vegetables grown in Queensland gardens is the Tonga Bean, a native of India, where it is supposed to have been under cultivation for the past 3,000 years, but now widely found in practically all tropical and sub-tropical countries. Numerous varieties have been described, differing in the colour of flowers and seeds, the former from white to dark purple, the latter from white to almost black.

Plate 58.

TONGA BEAN.

Right: PURPLE TONGA BEAN (with two detached seeds).

Left: COMMON TONGA BEAN.

In Queensland we have two main varieties in cultivation, the Common Tonga[1] and the Purple Tonga[2]. The former has violet or pale purple flowers and light green pods, the latter very dark purple flowers and pods of a very dark green suffused on the rather crinkled edges

[1] *Dolichos lablab.*

[2] *Dolichos lablab* var. *purpureus.*

with purple. Both are probably equally good as a vegetable, especially the young pods, which, to get the full flavour, should not be over-cooked, 7-15 minutes in boiling water being ample. The young pods are chiefly eaten here sliced in the same way as French beans, but the nearly-ripe seeds can also be cooked, though the outer skin or covering is rather tough. In Malaya and the East Indies the ripe seeds are cooked and eaten either lightly cooked or raw as lalab, that is, a side dish with rice.

Attention is drawn to these beans, as numerous specimens, especially of the purple variety, which is a common ornamental vine in Queensland gardens, have been submitted to know if they are edible or not.

Lablab Bean, Sem or Sim Bean, Hyacinth Bean and Bonavista Bean are names by which it is known abroad. The Common Tonga is also frequently known in Queensland as Poor Man's Bean. It is doubtful how the name Tonga Bean, the commonest vernacular in Queensland, originated. Probably seeds were brought here originally from the Tonga Islands.

The Department of Public Instruction has done good work in distributing seeds of this valuable vegetable to school gardens. The bean is more suitable for the home garden than for market purposes, as it withers on keeping and loses a good deal of flavour.

ANSWERS.

Selected from the Government Botanist's outward mail.

Fodder Plants of the Geranium Family.

The Wild Geranium (*Geranium dissectum*) is a very good fodder plant, particularly for sheep, which are fond not only of the tops but also of the carrot-like root. The plant is sometimes called native carrot because of its root.

The Crane's Bill or Stork's Bill (*Erodium cicutarium*) is sometimes a weed of cultivation, but is also a valuable fodder. It is more abundant in southern Australia than in Queensland, where its place is taken by an allied species generally known as crowsfoot.

A Winter-growing Grass.

The English Meadow grass, or Goose grass (*Poa annua*) is a European native, now widely spread in the temperate parts of the world. It is fairly common in Queensland during the winter months, particularly in lawns. It does not do well in pastures, preferring sheltered situations.

Molasses Grass.

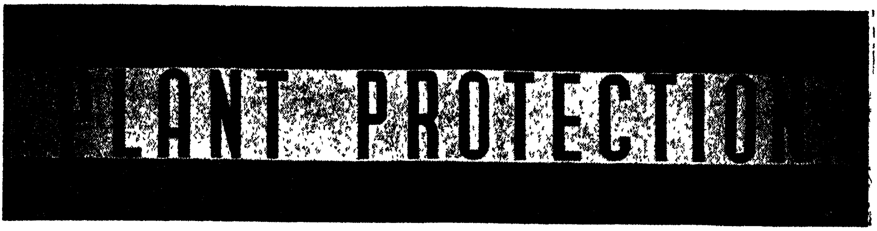
R.P. (Palmwoods)—

The specimen is Molasses Grass (*Melinis minutiflora*), in some parts of North Queensland one of the principal fodder grasses. Experience with it in the more southern parts of the State is that stock have to acquire a taste for it before they will eat it to any extent.

Red Cotton.

A.G. (Springsure)—

The specimen is the Red Cotton (*Asclepias curassavica*), a native of the West Indies and tropical America, now widely spread as a weed in most tropical countries, including Australia. It is a fairly common weed on many coastal farms, along creeks, and in vacant town allotments. Feeding tests have shown that the plant is poisonous to stock. On the other hand, 1½ lb. had no effect on a two-years-old bovine; 3 lb. eaten during two days was harmful to a cow but did not cause death; 7 lb. fed during eight days did not affect a cow. Under normal conditions, stock avoid the plant and the only trouble that has come under notice has been where calves have nibbled at the weed. Usually, they would eat far less than used in the feeding tests.



Insect Pests of Cabbages and Cauliflowers.

J. HAROLD SMITH, Senior Research Officer.

CABBAGES and cauliflowers are grown extensively in coastal Queensland during the autumn, winter, and spring months, and in upland districts, such as Stanthorpe, during the warmer months of the year. They are attacked by several insect pests, and few crops of these and related vegetables are grown without the application of insecticides in order to keep the pest population down to levels at which the plants can grow normally and be harvested in an attractive and saleable form. The ability of the grower to identify these different insect pests and to use the available methods of coping with them is fundamental to success in growing good crops of these vegetables.

The more important pests are the cutworm, the cabbage moth, the centre grub, the cabbage aphid, the cluster caterpillar, and the corn ear worm. Minor pests usually kept in check by measures applied for the control of other insects are thrips and the green peach aphid. A recent arrival in the State is the cabbage white butterfly. This insect is well known in other countries as an important pest of cabbages, and it may eventually assume a similar status in Queensland. The destructive stages of the insects and the damage caused by them may be identified from the following key in which the caterpillar measurements are given for full-grown specimens:—

(i.) Seedlings collapse at ground level, where the stem is injured; large, greyish-green or greyish-brown, curled caterpillars about 1½ inches long in the soil .. .. .. *Cutworm.*

(ii.) Terminal bud destroyed; small, pale-yellow caterpillars at the tip of the stem and partially enclosed in webbing .. .. *Centre Grub.*

(iii.) Holes eaten in the leaves—

(*a*) Small, green, spindle-shaped caterpillars about ½ inch long, feeding on the under surface of the leaf .. *Cabbage Moth.*

(*b*) Large, dirty-green to brown caterpillars about 1¾ inches long with wedge-shaped markings on the side of the body, feeding in the heart of the plant; ragged outer leaves .. .. *Cluster Caterpillar.*

(*c*) Large, green to brown caterpillars about 1½ inches long, feeding in the heart of the plant; no wedge-shaped markings on the side of the body .. .. *Corn Ear Worm.*

(*d*) Large, velvet-green caterpillars over 1 inch long, feeding on the leaves .. .. .. *Cabbage White Butterfly.*

(iv.) Damaged and curled leaves, but no holes—
 (*a*) Colonies of small, greyish-blue or greenish-yellow insects on the leaves .. .. *Aphids.*
 (*b*) Numerous small, active insects on the lower surface of the leaves; silvering of the leaf surface where insects occur .. .. *Thrips.*

Cutworm.

As a result of cutworm injuries to the stem at or near ground level, seedlings frequently collapse shortly after they have been transplanted into the field. The cutworms themselves may be found in the soil at the base of the plants and are the larval stages of one or other of some closely-related moths with very similar habits. They normally feed at night on the lower part of the stem in seedlings, but older plants, even if attacked, usually survive. Cutworms (Plate 59) are typically soft, greyish-green or greyish-brown caterpillars, which, when disturbed, curl up in clock-spring fashion. On emerging from egg masses laid by the female moths on the ground under low-growing weeds, the larvae are very small, and growth proceeds for some four to seven weeks until they are about $1\frac{1}{2}$ inches long. They then pupate in the ground and later change into moths with a wing span of $1\frac{1}{2}$ inches, dull-brown forewings, and light-coloured hindwings bordered by a smoky marginal band. Leaf damage due to cutworms is rare in cabbages and cauliflowers, though common on some other crops such as tobacco.

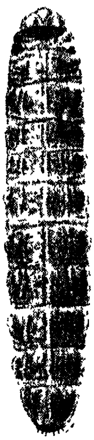


Plate 59. NEARLY FULL-GROWN CUTWORM.

Control measures should be applied as soon as seedling losses are noticed; otherwise the proportion of the crop destroyed may be large enough to compel replanting. These measures are very effective and require the use of a Paris green-bran bait, which is prepared as follows:—Thoroughly mix 25 lb. bran and 1 lb. Paris green on a mixing board; dissolve 1 quart of molasses in 1 pint of boiling water, and make up to 2 gallons with cold water; pour this solution on to the mixed Paris green and bran and stir to a moist, uniform, crumbly mash. When Paris green is not obtainable, arsenic pentoxide can be used as the toxic constituent. This alternative bait is prepared as follows:—Dissolve $\frac{1}{2}$ lb. arsenic pentoxide in 1 pint of boiling water, and similarly dissolve 1 quart molasses in a pint of boiling water; add $\frac{3}{4}$ gallon of cold water to each of the two solutions and then pour one into the other; next place 25 lb. bran on to a mixing board and pour the molasses and arsenic pentoxide solution on to it; stir to a uniform, crumbly mash. Both baits are distributed along the rows in small heaps about the size of a walnut, and these should be placed close to but not in contact with the plants. The whole area under crop need not be treated; baits in and around the rows where seedling injury has occurred will be adequate. The amount of bait required can be estimated on the assumption that 50 lb. dry bran will make enough bait to treat an acre of ground. A single treatment usually gives control, but a second application should be made if cutworms are still numerous two days later.

Cabbage Moth.

The cabbage moth (Plate 60; fig. 4) is a small, greyish-brown insect with a body length of about $\frac{1}{2}$ inch. The peculiar wing pattern is responsible for an alternative name, the diamond-back moth, for, at

rest, dark wedge-shaped colour patches on the upper exposed margin of the roof-shaped wings form a diamond pattern. In crops showing any considerable amount of foliage injury, the moths are invariably present, though they may not be seen until forced to fly when the plants are disturbed. They lay very small, oval-shaped eggs (Plate 60; fig. 1), singly or in pairs on the under side of the leaf, usually near the larger veins. After a few days—the period varies with the temperature—very small, colourless, larvae emerge and begin to feed on the under surface of the leaf. As they grow older, they eat holes through the leaf, though still feeding from below. In the later stages of development they occur almost anywhere on the plant, and, in cabbages, even penetrate into and through the compacted leaves forming the edible head. The older larvae (Plate 60; fig. 2) are green in colour, somewhat spindle-shaped, and about ½ inch long. When disturbed they drop from the leaf and hang in mid-air on a silken thread until danger has passed. On completing the larval stage, usually some five weeks after leaving the egg, they construct a sparsely-woven cocoon (Plate 60; fig. 3) on the under surface of the leaf and pupate within it. After transformation to the adult stage, the moth escapes from both the pupa and the cocoon to mate and initiate another generation.

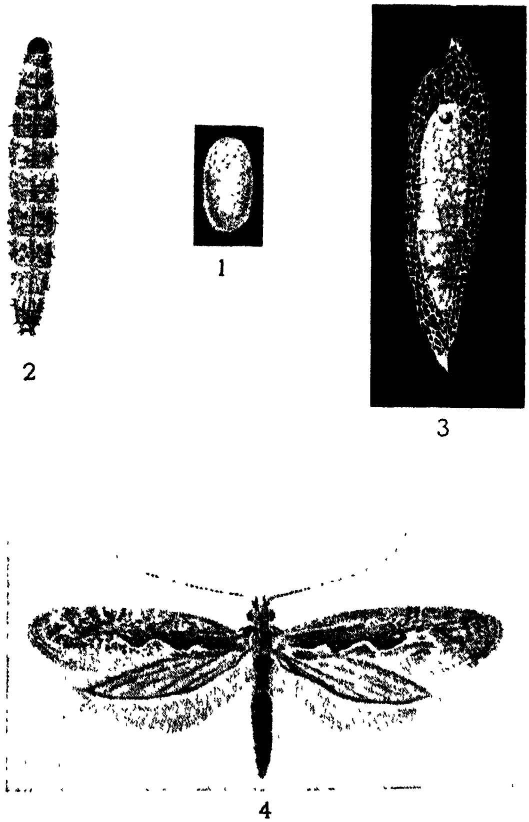


Plate 60.

Cabbage Moth: Fig. 1—egg × 25; Fig. 2—larva × 3; Fig. 3—pupa in cocoon × 3; Fig. 4—moth × 2.

[Drawings by I. W. Helmsing.

This pest can be found in most crops during the main growing season, and sometimes causes considerable damage, particularly during and after a mild winter when temperatures are not low enough to check its development. Normally the late winter and spring crops on the coast suffer most and, though a grower with successional plantings may escape heavy attacks early in the season, he is unlikely to do so when his later crops begin to mature. The midsummer and later summer crops in the colder districts such as Stanthorpe suffer more heavily than the early summer crops.

Fortnightly applications of lead arsenate in the seed bed and from transplanting to the beginning of heading followed by weekly applications of derris from that time to maturity give good control. The latter product is non-poisonous, and hence no toxic residues remain on the plants when they are harvested. Both insecticides are best applied as dusts, and the lead arsenate dust should contain at least 50 per cent. of the poison, while the derris dust should have a declared rotenone content of at least 1·5 per cent. When derris dust is not procurable, substitute insecticides are a white oil-soap spray, a 1 in 400 nicotine sulphate spray, and a 3 per cent. nicotine dust. The white oil-soap spray is prepared by adding 1 gallon summer white oil to 60 gallons of water in which 4 lb. soft soap has been dissolved; the nicotine sulphate spray is prepared by adding 1 pint of nicotine sulphate to 50 gallons of water in which 2 lb. soft soap has been dissolved; the nicotine dust is marketed as such. The substitute insecticides are somewhat less effective than derris for the treatment of crops in the later stages of growth, and must be applied thoroughly to both sides of the leaves. From the information at present available, the white oil-soap spray appears to be the most serviceable of these substitutes for derris at the present time.

Centre Grub.

Though not so important as the cabbage moth, centre grubs, the larvae of another moth, cause at times spectacular damage in coastal cabbage-growing areas. They are most destructive in autumn and seldom affect later planted crops. The adult moth (Plate 61; fig. 4) is rather larger than the cabbage moth and, unlike it, the wings are not roof-shaped when at rest. The wing colour is grey with buff markings arranged in a distinctive pattern. The small, oval eggs (Plate 61; fig. 1) are laid on the younger parts of the plant, and the young larvae hatching from them almost immediately burrow into the centre of the stem at its growing point. The tunnel is usually sealed with frass-cluttered webbing which frequently takes in some of the terminal leaves. This tunnelling may, if the attack is severe, be supplemented by attacks in the main veins of the leaves of older plants. The larva (Plate 61; fig. 2) is a nondescript, pale-yellow caterpillar with seven brownish stripes along the length of the body. When about ½ inch long, and full-grown, it pupates (Plate 61; fig. 3) within the tunnel where it previously fed, and later transforms into the adult moth. Seedlings in the bed or in the field usually die when attacked, but older plants throw out lateral buds which develop normally if they themselves escape infestation. Even so they cannot produce marketable heads unless the redundant buds are removed by hand, and as this is more or less impracticable on a commercial scale, any plant attacked is essentially a loss to the grower.

The inconspicuous feeding habits of this insect are such that an attack is usually in an advanced stage when first detected. Hence, if

insecticides are applied only when the injury is first seen, treatment will invariably fail to give adequate control of the insect. It is therefore better to regard this pest as a consistent menace to March and April planted crops on the coast and apply a lead arsenate dust to the plants in the seed bed and in the field up to the commencement of heading. From then on the necessity or otherwise for insecticidal treatments can be determined by the leaf injury due to other pests such as the cabbage moth. Weekly treatments with a 50 per cent. lead arsenate dust during the early life of the plant should meet requirements in coastal districts, where, on past experience, the pest is liable to cause trouble. Inland areas such as Stanthorpe usually escape attacks, and no special measures for the control of the insect are necessary there.

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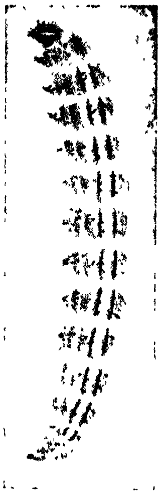

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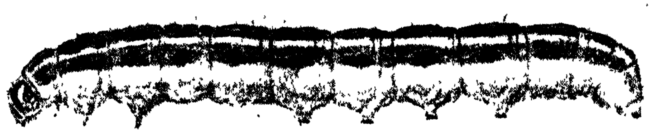
Plate 61.

Centre Grub: Fig. 1—egg × 25; Fig. 2—larva × 5; Fig. 3—pupa × 5; Fig. 4—moth × 5.

[*Drawings by William Manley.*

Cluster Caterpillar and Corn Ear Worm.

The work of the cluster caterpillar is familiar to coastal growers of cabbages and cauliflowers in Queensland, where the typical damage to the outer leaves caused by the young larvae is quite common. Most of these larvae die, but one or more may survive and penetrate to the centre of the plant and feed inside the head, giving it a ragged appearance. The stages seen by the farmer are the gregarious young larvae on an outer leaf where an egg mass about ¼ inch across and covered with shed body hairs of the parent has been laid, and the solitary more or less mature larva burrowing into and through the head. This latter stage (Plate 62; fig. 1) is about 1¾ inches long, and looks like an abnormally large cutworm, to which it is, incidentally, closely related. Dirty-green to brown in colour, it has dull, black, triangular markings along the side of the body. When full-grown these larvae leave the plant and pupate in earthen cells in the ground, from which the adults later emerge.



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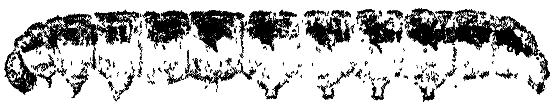

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Plate 62.

Fig. 1—Cluster Caterpillar × 2; Fig. 2—Corn Ear Worm × 2.

[*Drawings by William Manley.*

Another insect with somewhat similar feeding habits in the later larval stages is the corn ear worm, better known perhaps as a pest of tomatoes. The full-grown larva (Plate 62; fig. 2), the stage with which the farmer is familiar, is somewhat smaller than the cluster caterpillar, usually lighter in colour, and lacks the triangular marks which the latter has on the side of the body.

It is seldom that either of these pests occur on the cabbage without being associated with more destructive insects for which control measures should be applied. Treatment schedules in which lead arsenate or derris are used will keep the cluster caterpillar in check. Derris has, however, little or no effect on the corn ear worm and, as lead arsenate cannot be applied to the crop after the commencement of heading, little can be done to curb this insect when attacks take place as the crop approaches maturity.

Aphids.

Two aphids occur on cabbages and cauliflowers in Queensland. They are the cabbage aphid, a small, greyish-blue insect which clusters in dense colonies mainly on the upper surface of the leaves, and the green peach aphid, a larger species with a distinctive greenish-

yellow colour, and somewhat similar habits. Of these, the former is the more important. The cabbage aphid first appears on the leaves in small colonies, which include adults and a variable number of green-coloured young which have not yet acquired the mealy covering characteristic of the later stages. Such a colony may rapidly increase from day to day until the whole plant is a mass of insects (Plate 63). Feeding by puncturing the leaf and extracting the sap, these aphids soon curl the leaves and suppress the development of new growth. In the early stages of an attack some plants may show severe infestation, while others are more or less free from the insects. Later, however, the production of winged females from the earlier established colonies leads to the dispersal of the insect, and almost all plants are then infested, if parasites and predators fail to check the outbreak or control measures are not promptly applied.

Plate 63.

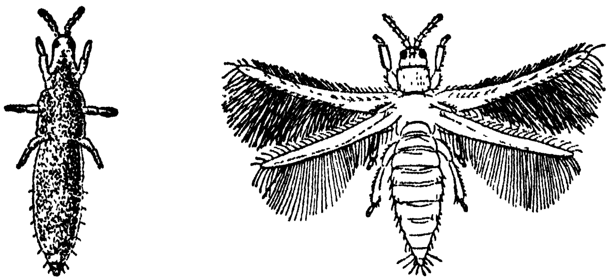
PORTION OF CABBAGE LEAF INFESTED WITH APHIDS.

Though wasp parasites and various predators destroy numerous aphids in the late stages of an attack, they usually become effective only when the damage is appreciable. A white oil-soap spray, a nicotine sulphate spray, and a nicotine dust destroy both species of aphids. Derris applied for the control of cabbage moth will also keep the cabbage aphid in check. The green peach aphid, however, appears to be more resistant to derris than the cabbage aphid, and when this pest is present in the crop, a nicotine dust, or one of the two other substitutes for derris, should be used to control it.

Thrips.

Very small, fringe-winged insects (Plate 64) known as thrips occasionally become so numerous on cabbages and cauliflowers that

control measures are required. These insects feed under the leaves and cause a silvering of the surface, which may later be followed by a breakdown of the leaf tissue, and the suppression of plant growth. When outbreaks occur and require special treatment, a 3 per cent. nicotine dust or the corresponding nicotine sulphate spray should be applied at weekly intervals until the pest has disappeared. As in the case of aphids, these insects are unlikely to be troublesome when contact insecticides are used for the control of cabbage moth.



1 2

Plate 64.

Cabbage Thrips: Fig. 1—larva × 12; Fig. 2—adult × 12. While at rest the wings of the adult are folded along the body.

Cabbage White Butterfly.

A notorious pest overseas, the cabbage white butterfly, has recently been recorded in Queensland, and may become a major pest in the future, though it is not so far known to occur in the main vegetable-growing areas. The moth has a wingspread of 1½ to 2 inches, and the white wings are ornamented with black tips and one or two black spots, the number of which depends on the sex of the insect (Plate 65). The pale, ribbed vase-shaped eggs are laid singly and hatch within a few days. The larvae grow to more than an inch long, and are then a uniform velvety-green colour. Transformation to the adult takes place in a chrysalis attached to the under surface of the leaf of the plant. The ordinary treatment schedule for the control of cabbage moth should keep this pest in check.

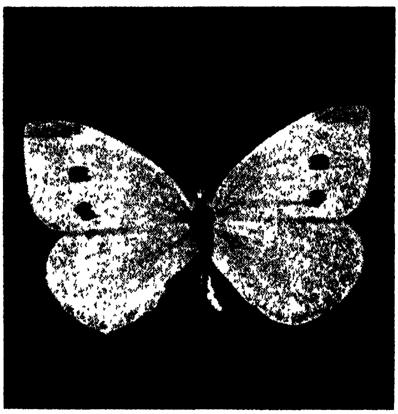


Plate 65.

Cabbage White Butterfly (actual size).

Insecticidal Control Measures.

Cabbage and cauliflower growers are seldom concerned with only a single pest, and it is a common practice to apply an insecticidal schedule

which will control those insects which are apt to be more or less troublesome every year, the schedule being modified if and when the intrusion of another pest warrants it. In coastal areas suitable schedules are:—

(*a*) For March and April planted crops:—Lead arsenate dust (50 per cent.) at weekly intervals to the commencement of heading for the control of centre grub, followed by no further treatment unless leaf damage due to cabbage moth or some other leaf-eating insect is seen in the field. If this occurs a derris dust should be applied weekly or fortnightly, depending on the severity of the attack. Should derris not be available, the white oil-soap spray referred to on page 220, a nicotine sulphate spray at a strength of 1 in 400, or a 3 per cent. nicotine dust may be used instead. Any of these alternative sprays will, if applied weekly during the heading period, give reasonable control of most leaf-eating pests as well as aphids.

(*b*) For May, June, July, and August planted crops:—Apply a 50 per cent. lead arsenate dust at fortnightly intervals in the seed bed and from transplanting until the crop has commenced to head. From then on, a derris dust, or its alternatives, should be used weekly until harvesting begins. In some seasons, pests may be relatively inactive and a certain amount of latitude is permissible, but it should be noted in timing the treatments that failure to check an outbreak in the early stages can easily prejudice the success of control measures applied later on. Regular inspection of the crop is therefore necessary in order that treatment may keep the pest continually under control, otherwise, damage which seems of no great consequence at the time may be followed by blemishes in the head when it is harvested and lessen the returns from the crop.

In the Stanthorpe district, where the centre grub is seldom, if ever, important, early summer crops need only be treated if leaf-eating insects appear on the plants, weekly or fortnightly applications of lead arsenate, derris, or its substitutes, being then applied according to requirements. Summer and autumn planted crops, however, will normally need the same pest control schedule as that applied to crops planted after May in coastal areas.

Cultural Control Measures.

Some of the more important pests of the cabbage and cauliflower feed on a considerable number of cultivated and wild plants. Some of these are present on most farms, and the insects can survive for long periods on them. Hence, once the crop is planted, it may not be long before pest populations increase to troublesome proportions if weather conditions are favourable for a rapid increase in numbers Cultural measures can do much to keep these initial populations at a low level and thereby simplify the pest control problem. The more important of these are:—(*a*) weed control during both the preplanting and cropping periods; (*b*) the destruction of crop residues as soon as harvesting is completed; and (*c*) rotational cropping so that, whenever possible, crops in the cabbage family will not be planted in succession on the same ground.

The Romney Marsh.

JAS. CAREW, Senior Instructor in Sheep and Wool.

AS the home of the Romney Marsh is the low-lying lands in the coastal marshy districts of Kent, the breed naturally excels all others for country in which conditions are similar. The native breed were large, coarse animals, which when fat dressed up to 160 lb. They were described as having coarse head and limbs, narrow chest and flat sides, but big bellies. They were slow to mature and fatten, and when topped off carried much internal fat, while the fleece was coarse and rather straight considering its length, with a fleece weight of from 6 to 7 lb. Even in their early days, however, the Romney Marsh sheep were rarely retained in their pure state, but were extensively crossed with the Leicester and later with the Lincoln. This crossing improved their form and covering, although their bulk was somewhat reduced. The present-day type (Plates 66 and 67), bears little resemblance to the old type.

Although even now not so symmetrical and well-shaped as many of the other English long-wool breeds, the Romney Marsh sheep possess a deep well-formed body on stout, strong legs. They have a strong constitution, which gives them an advantage over most other breeds in withstanding cold, moist conditions and exposure to wind and rain. These qualities and their comparatively thick skin and hard, dark hoofs, which ensure success under conditions in which other breeds would be likely to fail. They stand exposure to a remarkable degree

Plate 66.

ROMNEY MARSH RAM AT CHALDON, MALENY.—This ram is from a well-known New Zealand stud. Note typical characteristics—low-set, deep body and full quarters which are all to the good in mutton breeds.

when compared with some of the other breeds, which will hump their backs and refrain from grazing while the Romney Marsh eat their fill and appear contented. This is a valuable characteristic which is of particular importance in our higher rainfall regions.

The Romney Marsh type of the present day may be described as one of the long-woolled, hornless, white-faced breeds, having a broad, massive head, thick but not extensive woolly forelock, thinner between the ears. The ears are thick and large, set down well on the side and covered with white hair. The eyes are large, fairly prominent, mild, with rather a dull heavy look. The nostrils are set well apart, with a dark brown appearance. The neck is thick, fairly long, slightly arched and thick at the base, well set on and tapering slightly at the head, which is not held as erect as in other breeds. The back is straight, long, and wide at the loins, and slightly drooping to the tail; shoulders fairly wide, well set, and level to the back; chest fairly wide and deep; sides rather flat; belly and thighs full and weighty; legs well set apart, thick, strong, and heavy boned, with large feet. The covering is rather straight and open, somewhat lacking in character, and not so long as the Leicester, and is demi-lustre in colour. Rams produce a fleece of about 12 to 15 lb. in weight, having a commanding length of about 4½ to 5 inches, with a spinning quality averaging from 46s. to 48s.; while the ewes produce a lighter and finer fleece.

As the breed is used largely for crossing with the Merino, its suitability for that purpose is well known and appreciated. The half-bred is a very desirable type, and on small holdings where a dual purpose breeding flock is desired they meet most requirements with satisfaction. Although slower as lambs than the Border Leicester, they develop into well-shaped bulky lambs of good quality. The chief advantage, however, is achieved by bringing the half-bred ewes into the breeding flock. They develop into good, large framed, deep bodied, strongly constituted ewes, docile to handle, and which adapt themselves to small paddocks and cultivated crops, giving a good percentage of lambs with little trouble. They mate most successfully in the late summer and autumn. The cross is most desirable on the lower lands, and stands the heavier coastal humid air better than the other crosses do. They make excellent mothers for the rearing of fat lambs, especially when mated with the quick maturing, compact Downs breeds. As the ewes

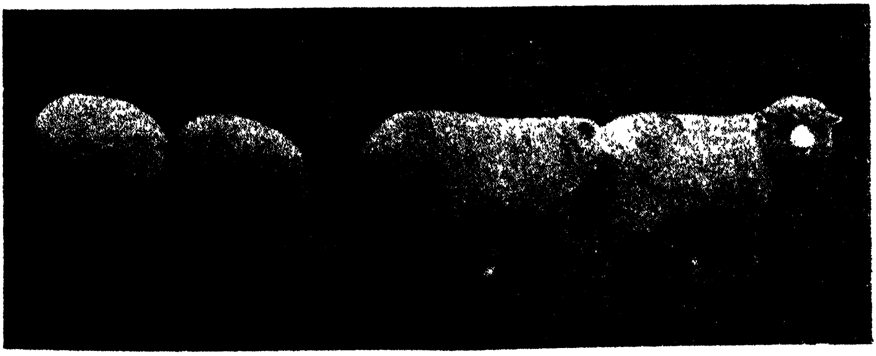


Plate 67.

Units of the Chaldon Ewe Flock on their Home Pasture on the Blackall Range (Q.).

are good milkers, the lambs develop quickly. The lambs carry the influence of the sires in form, which fits them with the carcase so desirable for the fat lamb trade.

The flesh of the pure Romney Marsh is coarse and light in colour as compared with the Merino, which is finely grained and darker in colour. The blend of the two breeds results in a carcase rich in colour and fine in texture. Further blending with the Downs type produces the plump quarters which dress to advantage.

In Queensland, at least two Romney Marsh studs have been established, one at Yandilla and the other at Maleny. The Laguna Stud at Yandilla, the property of C. H. Heath, started with high-quality breeding stock of both sexes and later infusions of new blood have maintained a high stud standard. On H. B. Roberts' property, Chaldon, Maleny, a fine breeding flock is steadily building up, the latest introductions including rams from well-known New Zealand stud flocks, and which have already stamped their progeny with characteristics showing excellence in type and quality. The sheep industry in Queensland has already benefited greatly by the enterprise of these two studmasters.

Hints on Sheep Management.

J. L. HODGE, Instructor in Sheep and Wool.

LET us take it that the sheep are "off shears" and the year's operations on the selection are commencing on that basis.

Before leaving the shed, the sheep should be legibly branded with the registered brand. The brand should be properly applied in the allotted position. Frequently, the brand is carelessly placed, sometimes leading to confusion if a few sheep should become boxed with travelling sheep. Care is necessary in a thorough stirring of the branding fluid. If this is not attended to the mixture may be too thin, and the substance of the fluid goes to the bottom of the container.

The allotment of paddocks to the various flocks should receive more attention than is sometimes given to it. For instance, there may be some forward-conditioned wethers which it is desired to dispose of later in the year. These should be drafted out and given a paddock in which they will "top up" at the earliest date. Weaners should be grazed on country free from grass seed and in a paddock in which they will not get "lost." It is a good idea in this connection to allow a few older sheep to go with weaners. Reserve country should be kept in mind for lambing ewes. Attention to all these apparently minor matters makes for the better condition of the whole of the sheep.

Slack Time Jobs.

Off shears time is the period of greatest liberty with the grazier. Therefore, at this period of comparative slackness fences should be attended to. Slack wires here and there, the replacement of posts where required, the adjustment of a strainer with a new strut, the hanging

of a gate which has commenced to sag and has become an annoyance—attention to all these things saves time during the year, securely holding the various flocks in their respective paddocks and thus cutting out unnecessary drafting. The water supply, if other than a natural supply, also should receive attention. Windmills should be efficiently overhauled, tanks attended to, and troughing put in complete repair. A few dray loads of stone may be necessary in the approach to a trough.

Dipping.

If dipping has to be done of necessity, or as part of the yearly operation, on the property, about six weeks after shearing is the time recommended, when they have recovered from the shearing, and all cuts are healed and the six weeks' wool produced gives some slight retention to the dipping mixture. Off shears dipping, although satisfactory as far as the destruction of lice and ked is concerned, leaves something to be desired. Then, there is the risk of arsenical poisoning by absorption in shear cuts, although the retention of the dipping mixture on the skin is very slight.

Every care should be given to the preparation of the dipping bath. One of the proved proprietary mixtures is recommended. Closely follow the direction of the maker as to quantities per 100 gallons. The holding contents of the bath should be accurately known. Prepare a powder dip to the consistency of mixed mustard before adding to the water in the bath. Thoroughly stir from the bottom before putting sheep through.

The choice of the day is important. It should not be too hot. On the other hand, a cold bleak windy day is to be avoided. Sheep should never be dipped while in a heated condition. Give plenty of time to drain. If practicable, dry in the shade. Do not drive sheep long distances, or hurriedly, after dipping. Keep lambs off their mothers long enough to avoid any chance of arsenic poisoning.

Lambing and Marking.

The time of joining the rams is important. No hard and fast rule may be laid down. Graziers are advised to join at a time proved successful in their particular locality, having in mind a time for dropping when the blowfly is not likely to be prevalent. The period of gestation with sheep is five months. After lambing, the marking of the lambs is an operation which cannot be put off. The best time for marking is when the lambs are a fortnight to three weeks old. The operation embraces the castration of the ram lambs, the removal of the tails of all lambs and the insertion of the registered earmark in the near ear of ewe lambs and the off ear of ram lambs. The work should be done under the most hygienic conditions possible. If there is any doubt about infection in old yards they should not be used, and temporary hurdle yards erected in the paddock in which the lambs and ewes are running. Slitting and tipping are both practised. Of the two, the latter is preferable. It is faster, a consideration where large numbers of lambs are to be treated, and it is thought that the wound drains better. However, for slitting it is rightly claimed that a larger cod is the result. This certainly looks well in a nice even line of wethers.

All knives and earmarkers should be disinfected and dipped frequently in an antiseptic mixture during the work. If blowflies are prevalent, or likely to be, a dressing both disinfectant and curative should be applied to tails and purses.

Crutching.

By way of making the one muster do, the opportunity should be taken, while the ewes and lambs are in hand, to crutch the ewes. This should be a yearly operation, and should be done particularly well. Crutching certainly costs something, but is a definite deterrent to blowfly strike, and the value of the wool saved is some considerable offset against the cost of the operation. Unless the job is done well it is a waste of time and money.

Ringing and Wigging.

After the ewes are dealt with is an opportune time for the ringing and wigging of the wethers. Then, too, with the sheep in hand may follow the selection of any fats fit for market. In this connection, it is pointed out that it is unprofitable to send sheep to market unless definitely fat. Too often a grazier sends a consignment with only a proportion of fat sheep in the lot. How much more profitable to pick out the fats, and market in this condition, even if it entails sending a number of consignments! Store sheep do not bring their value in competition with fats.

Weaning.

When lambs attain the age of about five months, weaning or the separation from their mothers becomes necessary. Weaners require the best paddock on the property. They feel temporarily the loss of milk to which they are accustomed, even if they were getting very little. In consequence, to maintain condition and grow satisfactorily, they should be well sustained. Beware of a seedy paddock or long grasses where weaners are concerned.

Culling.

With the near approach of shearing, culling becomes a necessity on a well-managed property. The nearer the fleece is to twelve months' growth the better. Reject from the breeding flock all those ewes which do not conform to the type aimed at. Cull, too, sheep undersized, wrong in conformation, poor doers, and those showing bad hocks and bad faces. With the ewes retained in the flock, the grower would be well advised to join rams of a higher grade selected to "nick" with the type aimed at. Thus, with the retention of the best of the ewes and the purchase of better rams, rapid progress will be made in the achievement of a flock commercially profitable. For some months before shearing, every effort should be made to save the feed in the paddocks near the shearing shed. Some little starving of the flocks is inevitable at shearing time, but a lot can be done to minimise this condition by a little forethought.

Shearing.

A careful manager does not leave the preparation for shearing until the last minute. There are always a lot of things to do round a shed to ensure a smooth start. Pens may want attention, down chutes must be put in repair, sagging gates in count-out pens and other places fixed, the wool press and ropes overhauled, the machinery seen to, and in fact details too many to mention.

The preparation of the clip is of the utmost importance. Correct classing should be insisted on. A good classer earns far more than the money he gets for the work.

So we have a brief résumé of the twelve months' work on the selection.

Fodder Conservation.

P. ROUND, Dairy Inspector, Pittsworth.

THE principles of fodder conservation have always been sound, but its practice has often resulted in disillusionment and disappointment. When failures are analysed, however, it is found that the fundamental principles have not been observed. Livestock production, whether it be for meat, milk, or wool, cannot succeed without adequate food for the farm animals. Nature unaided will not provide sufficient sustenance in all seasons. Queensland is fortunate, however, in that hand feeding of stock in most years is only necessary for short periods. It is not proposed to discuss fodder provision for long, dry periods except to suggest the principles laid down may be amplified to reduce the incidence of stock losses during a time of drought.

Dealing specifically with dairying on the Darling Downs, where herds are fed largely on cultivated crops, it is obvious that only limited numbers of cows can be profitably fed. Intense cultivation and dry farming methods practised by progressive farmers have resulted in the production of fodder crops in very adverse seasons. That this alone is not sufficient is evidenced by the recent serious decline in milk production, but if the growing of fodder crops were allied with a practical system of fodder conservation, steady production could be maintained.

Livestock must return a profit for the food consumed. If fodder has to be purchased at drought prices for any length of time, very few classes of stock will repay the outlay. The type of fodder necessary to maintain stock in health and condition is usually the cheapest to grow, but if increased milk production is desired, then the more expensive, protein-rich fodders have to be provided. It is as uneconomical to feed these as a maintenance ration as it is disappointing to feed a merely maintenance ration and hope for greater production.

Fodder conservation may be divided, broadly, into two sections—

(1) Conservation of enough cheaply-grown fodder to maintain stock in health;
(2) Conservation of enough high-quality fodder to provide both a maintenance and a production ration.

The Value of Sorghum.

The quantity of fodder conserved should be based on the number of animals which can profitably be carried on the farm. If a sufficient

area is planted to provide grazing in a lean or even a normal year, a superabundance of fodder will be obtained in a flush season. If a maintenance ration only is desired, sorghum crops are easily the best for the purpose. They provide a heavy tonnage to the acre, which may be conserved either as hay or ensilage. On the Downs, sorghum hay has been opened in perfect condition after fourteen years.

The greatest deterrent to sorghum haymaking is (1) It is heavy work. (2) The stooks have to remain in the paddocks for periods varying from six weeks to three or more months. Much valuable grazing on the stubble is therefore lost, or its use is delayed, and the cultivation of the land also is retarded. These disabilities could be overcome by using reaper binders for delivering the sheaves on to a trailing lorry for transport to an area near the stack yard to be stooked until cured.

Sorghum ensilage was made extensively on the Downs in pre-war years. Ensiled crops leave the stubble and land available for immediate use. The soil on many farms is suitable for trenching, which is the cheapest method of ensiling crops. A large measure of success in handling sorghum crops has been achieved with the ordinary reaper and binder. The main difficulty is labour to load and unload the sheaves. The unloading difficulty has been overcome by some farmers who pull the whole load off the wagons into the trench. Six years experience on one farm alone has proved the value of this method. Another farmer improvised an automatic carrier attachment on his reaper which delivered the crop to a lorry trailing alongside. Consequently, the hardest and slowest part of the work can be mechanised.

Sorghum has been grown and ensiled in the Pittsworth district for less than 5s. a ton. The mechanisation of haymaking for such crops as lucerne, wheat, and oats would greatly lower their cost. With modern haymaking machinery, baled lucerne hay can be produced for £4 a ton in good seasons on suitable land. Grain sorghums are profitably produced and sold on the Downs at less than £5 per ton.

A maintenance ration for a cow would be ½ cwt. of sorghum ensilage per day, costing approximately 1¼d. If a production ration is desired, then the more expensive fodders rich in protein should be added.

A big cow, giving 3 gallons of milk, testing 4 per cent. butter-fat, may be kept up to that production by feeding:—

40 lb. good quality sorghum ensilage at ..	1¾d.	per day
14 lb. good quality lucerne hay at	6d.	per day
6 lb. crushed grain approximate at ..	4d.	per day
	11¾d.	

Assuming a farmer had—

	£
96 tons of ensilage costing	24
25 tons of lucerne hay costing	100
10 tons of grain costing	50
	£174

An allowance of, say, one-third more to cover interest for three years and other sundry expenditure would amount to £58, making the total £232, bringing the feed cost up to 1s. 3d. a day.

The permanent labour on the farm is usually adequate for feeding out, for at periods when feeding becomes necessary, much of the normal work of the farm cannot go on. Taking the average price of milk as 9d. per gallon, a cow producing 3 gallons of milk a day would return 2s. 3d. for the 1s. 3d. worth of feed used. Many dairymen contend that if it costs the whole return to keep fresh cows in production during a short, dry period, it is money well spent, as when green feed is again available, the cows continue in full profit.

Every dairyman knows that to make dairying profitable, cows should produce to their maximum capacity for most of the year. Cows freshening when pasture is scanty often dry off after a few months, with the result that when good milk-producing feed is again available the cows are stale or dry. Consequently, a valuable production is then used merely as a maintenance ration, which is definitely uneconomic. The given quantities of conserved fodder would keep 20 cows in production for six months. Another 106 tons of ensilage would maintain another 20 dry cattle for six months. Some other small incidental expenses may have to be provided for, but the margin of profit would be still wide enough to cover them.

No depreciation need be provided for ensilage. Baled hay will keep for years under cover. Unused grain might have to be turned over annually. When a new crop is assured, the stored grain may be sold. As it is usually in demand at that time, the extra price prevailing would help to offset the loss of weight. Consequently, after the first year, the grain would nearly finance itself.

Farmers depending on cultivated crops for pasture cannot afford to neglect their ploughing and planting operations, and as these are often at their peak when other crops are ready for conserving, the normal labour on the farm is usually inadequate. The most effective way to overcome this difficulty would be co-operative effort between groups and the co-operative use of suitable labour-saving machinery.

Plate 68.

A Queensland Farm Homestead.—Mr. J. M. Newman's property, Caboolture.

The Methylene Blue Test.

C. R. TUMMON, Dairy Inspector.

UNLIKE cream, milk is not graded on taste and smell alone. There is a practical test, called the methylene blue test, now in general use in factories and milk receiving depots, and this test is applied to every farmer's supply. Briefly, methylene blue is a substance which, added to a sample of milk, turns the milk blue. This substance is absorbed by bacteria, and the quality of the milk is judged by the time taken in the absorption of the colouring, the milk afterwards returning to its normal colour. For example, if the colouring takes only a short time (two to three hours) to disappear, it indicates that bacterial contamination is considerable. If it takes much longer (seven to eight hours) for the colouring to disappear, it is an indication that the number of bacteria is very limited and that the quality of the milk may be regarded as good.

Many farmers become worried on receipt of notices from the factory stating that the methylene blue test on their milk was unsatisfactory, and they do not realise the causes, or means of overcoming the trouble. Far too often the blame is attributed to sick cows, rusty cans or other utensils. While these factors may possibly be contributory at times, they are rarely the main cause. The trouble is caused by some important factor or a combination of factors, resulting in a considerable amount of dirt or bacteria getting into the milk at some stage of production or handling.

The following advice is given, therefore, so that farmers may know the likely causes of an unsatisfactory methylene blue test; and also that the remedy lies within their own power:—

(1) Make sure that no milk from quarters affected with mastitis, or from cows calved within seven days, is used.

(2) Wash cows' udders thoroughly before milking, using some antiseptic such as Condy's Crystals in the water, and change the water several times in the course of milking. Also wash hands frequently. Boil the udder cloths after each milking. Nothing could be worse than the practice of the "wet" milker who milks cow after cow without washing his hands.

(3) Reject the first drawn milk from each teat (two or three squirts). This is important. Keep this rejected milk in a separate bucket and feed to pigs or calves. It is better milked into a "strip" cup—(a home-made device would serve). This would serve the added purpose of revealing cows affected with mastitis.

(4) Use cotton wool filter discs for straining milk. If milk is put into the milk vat and the tap allowed to run slowly all the time into the strainer, which is placed on a can, there will be no delay in waiting for straining. To ensure a rapid flow of milk through the cotton wool filter disc, be sure to use a wide mesh gauze on the strainer, preferably 18 meshes to the inch. A fine gauze strainer (80 mesh) of the kind used for straining milk before separating the cream will not allow rapid milk flow through the cotton wool filter disc.

(5) Give more attention to the washing of utensils. Provide plenty of boiling water and adopt the following washing-up procedure:—

(*a*) Rinse all cans, buckets, and other utensils with cold water.

(*b*) Follow this with a thorough washing in warm water to which washing soda has been added, using brushes (not cloths).

(*c*) Finally, scald everything with boiling water, and allow to dry without wiping.

(*d*) For cleaning milking machines, caustic soda is preferable to ordinary washing soda. In fact, steam sterilisation should be the final stage of cleansing.

(6) Another important factor which should not be overlooked is the possibility of manure-dust contamination. Clean up all manure after each milking, and keep manure dust down to an absolute minimum. The holding yard should be cemented, if practicable. As an alternative it should be suitably paved. All manure should be shovelled up while fresh; otherwise, if allowed to dry and become pulverised, it is stirred up by cows in the yard during milking and some must inevitably settle in the milk and on utensils.

(7) Avoid, if practicable, the use of kerosene tins. In many milking sheds the milk is poured from the bucket into kerosene tins placed in the bails, and at the conclusion of milking these tins are carried into the separator room and the milk poured into the cream cans. This practice means extra work in washing-up, and is often a source of trouble with milk. Unless the seams of kerosene tins are well soldered, they provide an excellent breeding ground for bacteria, in spite of the most careful cleansing. Milk should be tipped straight from the bucket into the milk vat. Straining may then be done when the milk is passed through the tap of the vat into the can.

(8) Make sure the can is not still hot when milk is delivered into it.

(9) When milk has to be conveyed long distances it is a definite advantage to aerate and cool the milk over a surface cooler before it leaves the farm.

PRODUCTION RECORDING.

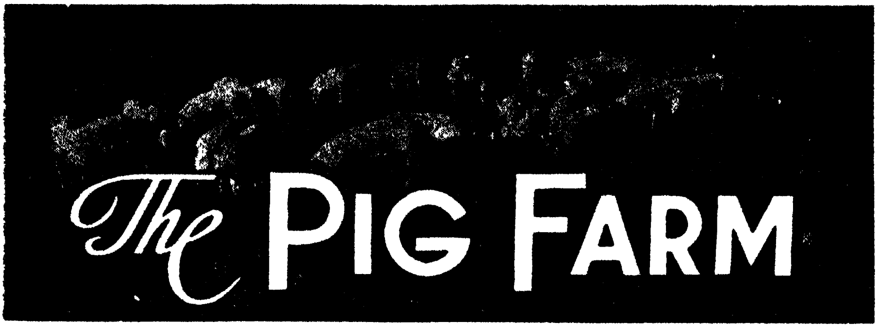
List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society, Jersey Cattle Society and the Ayrshire Cattle Society, production records for which were compiled during the month of July, 1943 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
JERSEY.				
MATURE COW (STANDARD, 350 LB.)				
Kingsford Evelyn	F. Z. Eager, Petrie	6,446 2	366·819	Oxford Aster's Remus
SENIOR, 3 YEARS (STANDARD 290 LB.)				
Colindale Lotus	G. Schroder, Ehlma, Warra	9,513·29	456·677	Grasmere Floss 20th Twylish
Gem Marie	W. Bishop, Kenmore	7,808·7	433·206	Calton Lothean
Mayfair Ruby	J. W. Carpenter, Helidon	7,038 5	385·951	Trecarne Victory
JUNIOR, 3 YEARS (STANDARD 270 LB.)				
Ashview Fancy	C. Huey, Sabine	5,427·3	321·58	Trecarne Butter Queen's Officer
SENIOR, 2 YEARS (STANDARD 250 LB.)				
Elwyn Buttercup	E. J. Dunning, Stanmore	6,163·55	329 884	Glenside Lone Star
Elwyn Butterfly	E. J. Dunning, Stanmore	5,962·15	304·022	Glenside Lone Star
Navua Spotted Countess	F. Z. Eager, Petrie	4,134·75	267 771	Dreamer's Hamptone Star
JUNIOR, 2 YEARS (STANDARD 230 LB.)				
Colindale Kitty	G. Schroder, Warra	6,557·16	332·126	Golden Hill Socks
Lermont Joyful	J. Schull, Oakey	5,542 9	320 041	Belgonia Lady's Duke 2nd
Lermont Melody	J. Schull, Oakey	5,473 9	281 422	Woodside Golden Volunteer
Ashview Erin	C. Huey, Sabine	4,919·35	273·963	Trecarne Butter Queen's Officer
Lermont Daisy	J. Schull, Oakey	5,848·8	270·95	Woodside Golden Volunteer
Lermont Princess	J. Schull. Oakey	5,004·55	261·239	Woodside Golden Volunteer
Lermont Nancy	J. Schull, Oakey	5,178 9	250·547	Belgonia Lady's Duke 2nd
Woodview Lady	P. H. Schull, Oakey	4,866·05	240 935	Lermont Victory
Ashview Countess	C. Huey, Sabine	3,850 05	238·644	Trecarne Butter Queen's Officer
Ashview Chimes	C. Huey, Sabine	4,978·8	231·71	Trecarne Victor 4th
AYRSHIRE.				
JUNIOR, 4 YEARS (STANDARD 310 LB.)				
Leafmore Anita	J. P. Ruhle, Motley	7,200·65	311·228	Myola Jellicoe

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock, which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Ayrshire Cattle Society, production records for which were compiled during the month of August, 1943 (273 days unless otherwise stated).

Name.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORN.			
	MATURE COW (STANDARD 350 LB.).			
Edendell Bangle	A. Manderson, Gleneagle	9,389·35	373·255	Blacklands Chieftain
	SENIOR, 4 YEARS (STANDARD 330 LB.)			
Alfa Vale Pansy (365 days)	W. H. Thompson, Nanango	19,823·5	886·733	Reward of Fairfield
	SENIOR, 3 YEARS (STANDARD 290 LB.).			
Trevor Hill Primrose 3rd	W. Henschell, Yarranlea	12,308 0	474·872	Corunna Supreme
	JUNIOR, 3 YEARS (STANDARD 270 LB.).			
Hillfield Pansy 5th	W. Caldwell, Bell	7,003·0	288 517	Trevlac Leslie
	SENIOR, 2 YEARS (STANDARD 250 LB.)			
Ventnor Mab 6th	C. W Black, Kumbia	6,289 2	278 484	Kyabram Twinney Boy
Mountain Camp Goldenia	W. Caldwell, Bell	5,606 24	252 074	Rosenthal Red Major
	JUNIOR, 2 YEARS (STANDARD 230 LB.)			
Mountain Camp Reflections Rosette	W. Caldwell, Bell	5,742 21	254·344	Trevor Hill Reflection
	JERSEY.			
	MATURE COW (STANDARD 350 LB.).			
Trecarne Chimes 3rd	T. Petherick, Lockyer	7,073 8	411·393	Trinity Some Officer
Trecarne Princess	T. Petherick, Lockyer	6,305·95	384·719	Trinity Some Officer
	JUNIOR, 3 YEARS (STANDARD 270 LB.).			
Trecarne Chimes 5th	T. Petherick, Lockyer	5,866 65	353·993	Jerseylea Golden Duke
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
Meadowvale Ginger Girl	Young Brothers, Kingaroy	5,788·85	312·841	Banyule Altair
Bellgarth Opal 4th	D. R. Hutton, Cunningham	5,469 83	292 237	Carnation Fair Lad
Trecarne Dairymaid 5th	T. Petherick, Lockyer	4,502·9	272·351	Jerseylea Golden Duke
Lermont Dainty	J. Schull, Oakey	5,385 8	258 704	Belgonia Lady's Duke 2nd
	AYRSHIRE.			
	MATURE COW (STANDARD 350 LB.)			
Leafmore Delphine	J. P. Ruhle, Motley	7,343·75	357·046	Leafmore Clarry



Feeding Bacon Pigs.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

MANY of the pigs marketed during prolonged dry periods are not in the primest of condition for slaughter, and when slaughtered their carcases dress out soft or discoloured, and on grading are classed as of other than first grade. In some instances the fat is soft and oily, and in others of a slightly yellowish colour that will not firm up during the chilling process. If used for small goods, this soft, oily, discoloured meat still carries objectionable features. The loss to the industry through this trouble, plus the lower condition of many of the pigs that kill out to advantage, is very heavy, for it is impossible to expect factories to pay top prices for second or third grade carcases.

Over-fat Pigs.

Under Queensland conditions the over-fat pig is a greater problem than any other because there is absolutely no demand for meat carrying an excess of fat, whether it be bacon and ham, pork, beef, mutton, &c., and it does not pay manufacturers to reduce the amount of fat by the process known as "de-fatting," seeing that the value of lard and low-grade fat is low in comparison with first-grade meat.

A typical illustration of this particular trouble came under notice quite recently. The farmer concerned has been marketing bacon pigs for 25 years or more, and has always considered his pigs to be of suitable type. The writer visited his farm some weeks ago and, in discussing the marketing of some baconers approaching the heavy-weight stage so much asked for, suggested that the best and most dependable way of determining whether they were in prime or in over-fat condition would be by having the carcases judged (appraised) at the bacon factory to which they were to be consigned. This carcase appraisal is carried out by Instructors in Pig Raising, free of charge to the farmer, provided sufficient notice is given beforehand to permit of arrangements being made and, provided the pigs are given an additional brand other than the vendor's usual brand, this to facilitate picking them out on arrival at the factory, and before slaughter. If the pigs are being firebranded they should have a special mark on top of neck or off top of shoulder or an additional tattoo mark on back of neck or on shoulder, plus a paint mark on middle of back, which further facilitates selection before slaughter.

In the case referred to, the inspection of the pigs at the factory before slaughter suggested that while they were well within the

140-180 lb. dressed weight range, they were all over-fat—both the farmer and the trucking agent each had their suspicions that this would be the case—on slaughter. The pigs, 11 in number, were graded, seven as excessively fat, and four as second grade, all the carcases carrying from a minimum of 2 inches back fat to a maximum (by measurement, not by guesswork) of 2¾ inches fat along the loin, back and shoulder. The farmer suffered financial loss, plus the loss of an excessive amount of maize in process of over-fattening.

The simplest way for any farmer to gain definite information is through this appraisal system, which has the additional advantage of permitting inspection of lungs, liver, kidneys, and other organs in search for disease and for parasites, this permitting advice being given regarding management.

Pigs should not be fed too heavily on grain, but be kept growing and be given abundant exercise in grassy pastures. It is a mistake to keep pigs penned up continuously in small sties and bare yards. The use of flesh-forming foods like milk, meat meal, lucerne, greenstuff, &c., and mineral matters will tend to overcome any tendency to over-fatness.

Soft, Oily Pork.

Although several foods may be responsible for this soft condition, all the evidence points to the fact that the chief cause of the trouble is the feeding of peanuts to pigs which are being prepared for or topped up for the market. Maize and other grain foods are, at present, relatively scarce and very high priced, and as peanuts produce particularly fast growth in pigs, farmers are naturally tempted to use them in place of grain. The position could be relieved if pig raisers would concentrate their peanut feeding on the breeding stock and young pigs, which will make very good use of surplus peanuts, and then other foods available could be kept for the pigs from the weaner stage until they reach bacon weights. Separated milk, root crops, pumpkins, lucerne (either as green fodder, hay, or chaff), and small quantities of pollard, meat meal, and pasture can be used to make up good rations in the absence of maize.

Yellowish-coloured Pork.

It is known that the probable cause of this condition is an excess of carotin, a colouring matter in plants, and which is present especially during the early life of the plant and at the stage when (as in the case of pumpkins) the crop is fully ripe or over-ripe. The feeding of an excess of green wheat, oats, or barley, in the absence of, or short supply of, milk may also be responsible; so also may the continuous use of grass or of lucerne as the principal food.

Low-conditioned Pigs.

Lack of condition is, of course, invariably due to lack of sufficient nutritious food. When pigs are in such a condition they become more liable to infestation by internal and external parasites, which irritate the animal and cause much restlessness, especially at night.

It is better to keep fewer animals and to feed them properly than to attempt the keeping of more than the number for which food is available, and it is better to market the pigs when prime to medium weight than to carry them on to heavier weights with loss of condition. Where milk is in short supply meat meal may be used as a substitute, and in

all cases the pigs should have clean drinking water and charcoal. War-time shortages of foodstuffs will have to be overcome on the farm very largely through farmers growing more of their own foodstuffs, just as householders are being urged to grow more vegetables.

Bruised and Damaged Pigs.

Where pigs are weakened as a result of lack of condition, and where they are soft in texture—the result of improper food—they bruise more rapidly, and tend to be more discontented. The only way to avoid bruising is to have the animals in the primest of condition (not over-fat) and to treat them kindly and not force or beat them when loading or unloading. Avoid knocking them about or forcing them through narrow gateways or over stony rough yards.

The better prices now being offered for all grades of pigs should be an added inducement to farmers to pay more attention to all these details of breeding, feeding, and management.

Transport Suggestions.

Bacon factory and meatworks managers urge that greater attention should be paid to pigs when trucking by rail, as well as in transit from farm to rail or sale and have emphasised the following points:—

Don't feed pigs on the morning of despatch to sale or to railway trucking yards. They travel better on an empty stomach. Although farmers often think their pigs realise a shilling or two more if they are filled up with feed before despatch, this is a fallacy. Buyers may be deceived sometimes, but they strictly observe the principle of "once bitten, twice shy," and will certainly pay a shilling or two less on future purchases, so the farmer will come off second best in the finish. No bonus is paid on dead pigs.

Trucking pigs overloaded with food results too often in deaths in transit. With the higher values now ruling for bacon pigs, factories cannot pay for dead pigs.

Experiments have clearly demonstrated that it may actually pay to starve pigs for 24 hours before trucking, as this is the greatest preventive of travel sickness and mortality. In these tests pigs fed heavily before despatch lost from 1 to 12 lb. and mortality was much higher than normal.

Don't try to save freight by overloading the wagons, especially during hot and humid weather. A pound or two saved in freight may easily result in a debit of £5 or more because of deaths in transit.

Pointers for Pig Farmers.

E. J. SHELTON, Instructor in Pig Raising.

THE pig is a grazing animal and, therefore, does better in a grassy paddock than when kept continuously in a sty.

Cleanliness in all operations is necessary on a pig farm. Buckets and other food containers should be kept clean; troughs should be scoured out regularly and moved frequently on to fresh ground; the milk drum should be regularly emptied and scoured, for the brownish curds that crust around the sides of the milk drum and fall into the milk are definitely poisonous. Milk fluming and piping should be cleansed regularly.

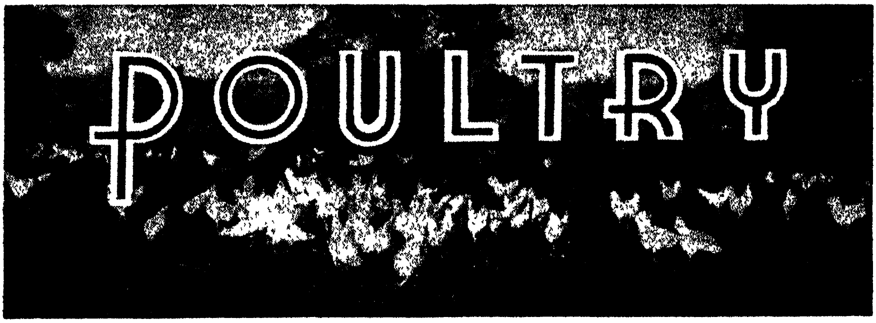
Cleansing of pigsties is a routine job, just as is raking up the yards and burning off rubbish; pig manure and waste bedding should be regularly distributed over cultivation land and be ploughed under and not be allowed to lie in heaps as breeding places for flies and other pests. Pig paddocks should not be allowed to become a harbourage for noxious weeds. Ornamental trees and shrubs provide a very much better shade and protection than weeds, besides adding value to the farm.

Drainage from the pig-feeding ground and from sties and yards should have regular attention and be kept clean and free from weed growth. Water troughs should similarly be regularly cleansed, and fresh water supplied daily.

The farm pig wagon should be washed out on return home from pig sales or trucking yards, and be kept clean and in good order. If a horse-drawn vehicle, the harness, pig net, and other gear should be kept in good order. Pigs will always realise shillings more if they are washed, dried, and are clean before being submitted for sale.

Prompt attention should be given to despatch of pigs sold as breeders, whether crated for rail delivery or personal delivery. The good business man takes advantage of every opportunity for advertising the stock he has for sale, even to printing the name of his farm and its location on the crate and on the address labels.

Prompt advice of despatch, explicit instructions about consigning and paying freight on returned empty crates, punctual posting of pedigrees and prize records are all part of the studmaster's job. Breeder's records should always be kept up to date. These and other business practices carry obviously the hallmark of efficient farm management.



The Storage of Eggs.

P. RUMBALL, Poultry Expert.

EGGS are preserved, on the commercial scale, almost universally by means of cold air storage. For the small producer or consumer, such a procedure is generally impracticable and resort has been made to simpler methods. Packing the eggs in sand, bran, ashes, lime, or salt was once used, but these methods have now been abandoned in favour of storage in solution in which the eggs are immersed and held until required for use.

The choice of a suitable solution is determined by certain considerations. The shell of the egg and its adhering membranes are permeable to water and certain dissolved substances, so care has to be taken lest the preserving solution contains an ingredient likely to pass into the egg, thereby affecting its flavour or contaminating it in some way. Various substances have been tried and rejected for different reasons, so that, at present, the two solutions most commonly used are a solution of sodium silicate, better known as water glass, and lime water. An excellent alternative method is known as buttered eggs.

Fundamentally, egg preservation still requires a certain degree of cold, and, although for satisfactory results constancy of temperature is unnecessary, it is essential that the eggs should be stored in a cool place where, if possible, the temperature should always be in the range of 33 deg. to 50 deg. Fahr.

Water Glass Method.—A strong solution containing approximately equal parts, by weight, of sodium silicate and water is sold commercially. It is very viscous and has a specific gravity of 1·7. A 5 per cent. solution of this is a convenient concentration to use.

Lime Water Method.—Four parts of finely-slaked lime are mixed with twenty parts of cold water and the whole well stirred at intervals for several days to ensure saturation. One part of salt is then added and the clear solution decanted and poured over the eggs, which should be placed in suitable wooden, cement or galvanised containers.

Buttered Eggs.—This is one of the easiest methods of storing eggs. It should be done soon after they are laid. Only good, fresh butter should be used, as inferior butter is likely to impart an objectionable flavour to the eggs. The process is quite simple. A small portion of butter is rubbed in the palm of each hand and the egg is then rolled between the hands, care being taken to ensure that every part of the

egg is smeared. When the eggs are completely smeared they should be placed in the holes of a perforated tray, broad ends upwards, and stored in a cold place which is not subject to much variation of temperature.

Preservation Principles and Practice.

If the egg storage containers are open to the atmosphere, the carbon dioxide in the air reacts with the solutions, giving a white precipitate. In the case of lime water, it is simply a precipitate of calcium carbonate, while with the water glass, silica itself is precipitated because of the neutralisation of the alkali. It is advisable, therefore, in order to maintain the solutions at the required strength, to cover the containers and so limit the ingress of carbon dioxide.

In each case, the eggs to be preserved should be clean and new-laid and should not at any time have been subjected to a temperature much higher than 60 deg. It is advisable, therefore, to candle the eggs and reject cracked ones, or any below the standard of freshness. Slightly soiled eggs may be cleansed with a damp cloth but not washed, and in no circumstances should badly soiled or cracked eggs be included. The receptacle in which the eggs are preserved should be perfectly clean and scalded with boiling water. Most investigators claim that water glass is the more satisfactory solution.

Using the solutions described, and in addition storing the eggs at a temperature of 32 deg. to 35 deg. Fahr., eggs have been preserved in the course of experiments for twelve months in both solutions with good results. The taste of the eggs stored in water glass was excellent, the air chamber was the same size as before storage, and the white had all the consistency of a new-laid egg. The eggs fried and poached well, but nearly always cracked on boiling unless the shell had been first pierced at the broad end. The only other point was that the shells had a slight crusty deposit, which was not removed on washing with water.

The eggs stored in lime water were not so good, although the flavour was excellent. In all cases the air chamber had completely disappeared and the white was more fluid and tended to spread when the contents of the egg were emptied into a dish. The shell in every case was markedly thinner and appeared rough. In general, the shell cracked on boiling, even though pierced. Presumably, the action of the lime water had made it very brittle.

The efficacy of water glass and lime water as a means of preserving eggs is without question. Used in connection with a rough system of cold storage (*i.e.*, paying no particular regard to constancy of temperature but merely temperate limits), either method gives excellent results, with the preference, so far as present experiments show, in favour of water glass. The cost of the water glass is small and apart from the extra labour involved—*e.g.*, the washing of the eggs on removal from the solution—the only disadvantages are that the surface of the shell is marred and there is every possibility of the shell cracking on boiling. It would seem, however, that further research might reveal ways of removing these objections. Moreover, there appears to be no reason why, if clean eggs alone are used, the same preserving liquid should not be used for several storage seasons. Lime water, possibly, has the advantage in this respect, as it is definitely antiseptic and is less likely to develop mould and bacterial contamination than water glass under the same conditions.

ANIMAL HEALTH

Milk Fever and Pregnancy Sickness (*Pregnancy Toxaemia*) of Ewes.

G. R. MOULE, Veterinary Officer.

MILK fever and pregnancy sickness are two conditions which occur in breeding ewes and which closely resemble one another. As it is possible to treat those conditions successfully, it is most important that a correct diagnosis should be made, and the following notes have been compiled to assist graziers in this matter.

MILK FEVER.

Milk fever is actually a misnomer for this condition, as there is really no fever—*i.e.*, no rise in temperature—associated with this complaint. The disease may occur before, during, or after lambing, but usually trouble occurs close to lambing time.

Cause.

Milk fever is caused by a sudden drop in the amount of calcium circulating in the blood. The occurrence of the disease does not indicate that there is an actual deficiency of calcium in the country. In point of fact, the level of the calcium content of the blood is controlled by a special calcium regulating mechanism, and during the time when the young lambs are developing within their dams' bodies or when the first flow of milk is being produced there is often a sudden call on the readily available calcium in the body. The animal body carries a large store of calcium within its bones and when there is a lag period between the *mobilisation* of the bone calcium and the time of *sudden call* on the *readily available calcium* of the body, milk fever develops.

Observations have shown that milk fever becomes much more prevalent as the age of the ewe flock increases.

Symptoms.

1. If the sheep are watched carefully, the first symptom seen is excitement. The ewes become very unsteady on their feet—stagger in their gait—arch their backs, and put their heads out as if in an effort to prevent themselves from falling.

2. When down, some animals manage to rise with great difficulty but if lifted they assume a cramped, crouched attitude, as though their feet were too sore to take their weight. At this stage there is usually considerable trembling of the muscles.

3. If the affected ewe remains down it becomes drowsy and finally unconscious, with glassy eyes and shallow, slow breathing, and appears to be dead Food is usually regurgitated from the rumen at this stage and the nostrils become clogged. The sick animal then makes a snoring noise when trying to breathe through the nose or else breathes through the mouth.

4. Despite the apparently unconscious condition of the animal it will be found practically impossible to bend the legs, which are usually stretched straight out.

5. Death usually occurs rapidly (*i.e.*, within 24–48 hours) in affected sheep if they are left untreated.

6. When a bad outbreak of milk fever develops, it is usually noticed that the unaffected animals in the flock appear to be drowsy and sleepy.

Treatment.

There are two methods of treatment, both of which will bring about spectacular recovery.

1. The obvious treatment is to correct the lowered blood calcium by the injection of a calcium solution under the skin. A suitable solution is prepared by warming the following ingredients until they dissolve in the water:—

Calcium gluconate, ¼-oz.; Boric acid, ¾-drachm; Water, 3 oz.

The dose is injected under the skin when the water has cooled to blood heat.

A stock solution of the calcium may be prepared and will keep well if tightly covered. The stock solution can be diluted and used as required. The injection is easily made under the unwooled skin—say, inside the leg—with an ordinary hypodermic syringe. The skin should be cleaned with a little methylated spirits or iodine before the needle is inserted.

An alternative to the above is to purchase calcium boro-gluconate already prepared and use it as a 20 per cent. solution, the dose being 30-50 c.cs. injected at blood heat as described above.

2. The older treatment, which is quite effective, is to distend the udder of the ewe with air. The air is pumped in with an ordinary bicycle pump, fitted with a special teat syphon. The greatest care must be taken to cleanse thoroughly the teat orifice and the teat syphon before inserting it into the udder. The gland should be only moderately distended after excess milk has been drawn off.

Whichever treatment is adopted, ewes usually recover in from half to one hour, though it is often necessary to distend some ewes' udders with air more than once.

Predicting Outbreaks.

Outbreaks of milk fever can usually be expected when pregnant ewes or ewes with lambs at foot are subjected to a period of fasting—*e.g.*, road or rail journeys or ewes held in yards during the pre-lambing, crutching, or jetting operations.

Under paddock conditions, care should be taken when feed is getting short and the ewes are on the down grade—*i.e.*, when the ewes are obviously producing lambs or milk at the expense of their bodily condition.

PREGNANCY SICKNESS.

Pregnancy sickness develops during the later stages of pregnancy of ewes. The exact cause of the disease is unknown, but it is known that the nutrition of the sheep does play an important part in its development.

Predisposing Causes.

It has been observed that sheep on a falling level of nutrition are more likely to develop pregnancy sickness. Sudden changes in diet will also precipitate an attack, as will sudden changes of weather to cold, wet conditions.

Periods of fasting, as when sheep are held in yards for crutching, jetting, or trucking and railing, have also been known to cause trouble, as will periods of fatigue following prolonged exercise—as on a road journey.

Symptoms.

The symptoms seen are indefinite but may be set down as follows:—

1. The ewes are dull, listless, and appear to be fatigued for several days before the outbreak develops.

2. The ewes are sometimes seen to stand with the head lowered as though they are eating, though there is actually disinclination to eat. Sometimes, on the other hand, the head is held high with the ears drooping.

3. The sight is apparently impaired and the sheep will stagger along with a blundering gait and swinging head.

4. Sometimes there is twitching of the face and ear muscles, grinding of the teeth, and fitlike seizures.

5. The careful observer will notice affected animals are inclined to be constipated, and while urination is normal at first it later becomes suppressed.

6. The offspring is usually alive until the time the ewe dies, though sometimes abortion occurs, and this is usually followed by recovery. If abortion does not occur, death usually supervenes.

Post Mortem.

Usually, there is nothing definite on post mortem; sometimes the liver is fatty and "soapy" and in many cases there are twin lambs, but this is not always the case.

Treatment.

The usual treatment recommended is to feed affected sheep large quantities of treacle—from 3 to 6 oz. given two or three times a day.

Predicting Outbreaks.

Pregnancy sickness can be expected in older ewes, especially if they are poor when pregnancy begins and do not enjoy relief rains during the gestation period, or in ewes fat at joining, but which are subjected to a "pinch" time late in pregnancy. Owners should also bear in mind the predisposing causes—exercise or fatigue, fasting, &c.

Prevention.

While it is a simple matter to recommend preventive measures which should prove satisfactory for both these conditions, it is often very difficult in the field to apply these recommendations.

Obviously, the circumstances which precipitate these attacks are often beyond the control of the flockowner, though those which are within his control, as prolonged fasting, &c., should be avoided.

Differential Diagnosis.

When just a few cases are occurring, it is often difficult to decide whether one is dealing with milk fever or pregnancy sickness. Stock-owners should carefully consider the history, symptoms, and the post mortem appearance for comparison. It should be remembered that pregnancy sickness ceases abruptly when lambing starts, whereas milk fever will often go on during and after lambing.

The following summary is useful in differentiating the two diseases:—

Milk Fever.	Pregnancy Sickness.
1. Usually abundance of feed, occasionally a sudden scarcity.	1. History of poor feeding for some time beforehand, sudden change of diet.
2. Road or rail journey or period of fast.	2. Road or rail journey or period of fast—sudden climatic changes to cold, wet conditions.
3. Sudden onset with sudden loss of consciousness.	3. Slow onset of symptoms, early loss of appetite, gradual onset of drowsiness, no sudden loss of consciousness.
4. Response to udder inflation and/or calcium injections.	4. No response to udder inflation and/or calcium injections.
5. Persists through lambing.	5. Course of disease about 1 week. Stops suddenly with lambing.

When in doubt, it is advisable to treat for milk fever by udder inflation or calcium injection, which give spectacular results with milk fever and will do no harm in pregnancy sickness.

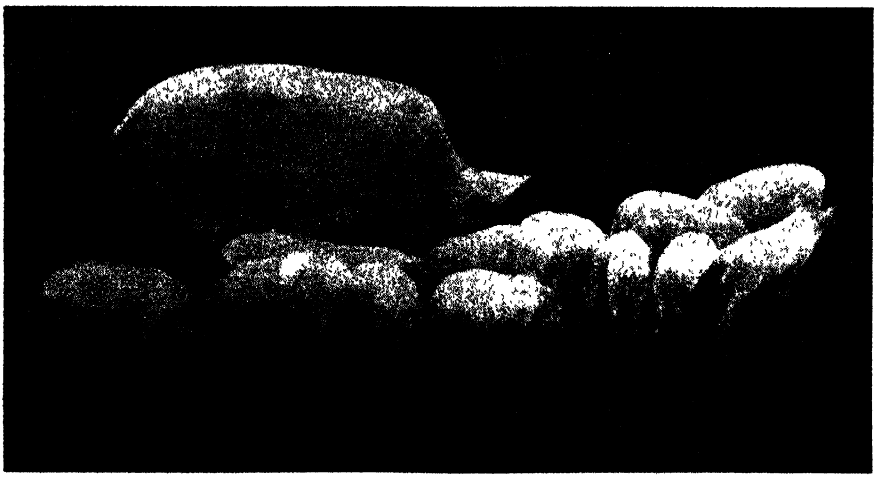


Plate 69.

LARGE WHITE SOW AND LITTER.

Treat Sheep for Stomach Worm Now!

MARSHALL IRVING, Veterinary Officer.

THE large Stomach Worm, or Barber's Pole Worm, is the chief internal parasite of sheep which will require the attention of graziers during the coming summer and autumn months. This parasite causes severe losses every year after early summer rains, and is, in fact, the biggest disease problem confronting sheepmen on the Darling Dawns and Central Highlands. It is always at its worst after the early storms and concurrent periods of warm cloudy weather, when existing infestations are rapidly built up to epidemic proportions. Timely precautions will forestall any serious outbreak during the summer months and make the parasite more easily controllable when later seasonal conditions become just right for its development.

It is advisable to drench from September until late in March, according to weather conditions. If there is a fall of from 40 to 50 points or more of rain spread over several days, or associated with dull, humid conditions, drench about twenty-one days afterwards. If wet weather continues, repeat treatment about every twenty-one days until the weather changes, and give a final drench about twenty-one days after the last wet day.

Therefore, the time to start treatment is NOW. One treatment just before the summer rains (or even immediately after the first storms) will do more to control this parasite than half a dozen later on. Repeat treatments should follow at intervals of two to three weeks after subsequent rains throughout the summer months.

Drugs Available.

A wide selection of drugs of varying efficiency and cost is used for the treatment of Stomach worms. These include carbon-tetrachloride, bluestone, bluestone-nicotine, bluestone-arsenic, and phenothiazine. In these days of scarcity, the cheapest and most readily available is the bluestone-arsenic mixture. It costs little more than 2d. per 100 sheep, and is at least as efficient as any of the others, except phenothiazine.

Bluestone-arsenic Mixtures.

The bluestone-arsenic mixture may be prepared in several ways; but the most favoured at present is the bluestone-arsenic pentoxide formula which is dispensed as follows:—

Dissolve—

½ lb. bluestone, and
2½ oz. arsenic pentoxide in
3 gallons of water.

Dissolve the arsenic pentoxide in the water; it will dissolve slowly in cold water and rapidly in hot water. Good quality arsenic pentoxide will give a water-clear solution in which the bluestone should be dissolved. Strain the liquid through a cloth before using it. Some grades of arsenic pentoxide on the market do not dissolve completely, but form

a sediment, and are therefore unsuitable for drenching. If sediment is formed, some sheep may be given enough to kill them, and others may not get enough to kill the worms.

Dose rates—

Grown sheep—1 fluid oz. (or 30 c.c.).
12-18 months—$\frac{3}{4}$ fluid oz. (or 25 c.c.).
8-12 months—$\frac{1}{2}$ fluid oz. (or 15 c.c.).
4-8 months—$\frac{1}{3}$ fluid oz. (or 10 c.c.).
Under 4 months—$\frac{1}{4}$ fluid oz. (or 8 c.c.).

Over-dosing is dangerous. Under-dosing is inefficient. It is, therefore, important to have accurate scales for weighing the ingredients for efficient and safe drenching. Three (3) gallons of the mixture are sufficient for 480 grown sheep.

It is important to realise that the bluestone-arsenic mixtures give a high degree of efficiency in about 90 per cent. of all sheep. The remaining variable percentage, approximately 10 per cent., in which this treatment fails can be easily recognised as a distinct "tail," and should be drafted off and treated with either carbon-tetrachloride or phenothiazine. This failure is due to the fact that in 10 per cent. of all sheep the bluestone-arsenic mixture does not go direct into the fourth stomach, and so loses its potency by becoming diluted in the contents of the paunch

General Control Measures.

Equally important with well-timed drenching is the application of certain general control measures designed to minimise the risks of re-infestation. By far the most important of these is the spelling of paddocks for a period of three to four weeks. By so doing, nearly all the infective larvae in the paddock will die, particularly if the weather is hot and dry, and so sheep which are later introduced will not become re-infested so quickly. Longer spells give little better results. If sheep are alternated from one paddock to another every three to four weeks, more benefit is obtained than by frequently repeated drenching in the same paddock. A change every three to four weeks gives best results, because in that time most infective larvae will die out in the unoccupied paddock, and at the same time none of the worm eggs distributed by the sheep in the occupied paddock can develop to the infective stage during the short period the sheep are present.

Drenching should be governed by prevailing weather conditions and should be done when the sheep are being moved into a spelled paddock.

Alternation of the sheep from one paddock to another is essential for the control of stomach worms, and has the additional advantage of providing better pasture, and hence better nutrition for the sheep. Such a system in combination with the drenching plan described will ensure better returns in wool and mutton, as well as a substantial reduction of losses.

The use of the correct drench at the right time produces the most benefit for the least expenditure of valuable drugs and labour.

THE TIME TO START TREATING SHEEP FOR STOMACH WORMS IS NOW.

Agricultural Chemistry

Specimens from Dead Animals.

W. R. WINKS, Analyst.

MANY samples of viscera are received for examination by the Agricultural Chemist. Of these, some are altogether unsuitable for analysis. Frequently, the senders request determination of common poisons. This involves long and expensive work. To avoid disappointment and to save both labour and chemicals, the following guide is set out for stockowners and others who submit either portions of dead animals or the materials suspected of causing death for analysis.

1. Animals usually show some symptoms before death. Note these, and if a veterinary surgeon is not available record them and include in any correspondence sent with the specimens. Veterinary surgeons may be able to diagnose the cause from the symptoms described.

2. See if the animal has eaten any plants not usually eaten by stock. This frequently happens in dry times and can be detected by a careful examination of the plants and shrubs in the various paddocks to which the animal has had access. Specimens of suspected plants should be sent with any specimens taken from the animal. Submit leaves, flowers, and fruit when possible.

3. State whether the animals have had access to dips, sprayed plants, or effluents containing poisons.

4. Ask for a determination of the poison suspected. Plant poisons are difficult—frequently impossible—to detect in stomach or intestinal contents. Suspected plants may be identified by the Government Botanist and their possible danger to stock recorded. Do not suggest cyanide, phosphorus, or strychnine poisoning unless any of those poisons have been used in the vicinity.

Cyanide is sometimes used (illegally) to kill possums. It may also be obtained from plants such as sorghums, but evidence of this can easily be obtained.

Strychnine poisoning is rarely found in grazing stock.

Phosphorus is not readily available except in crow or cockroach baits. It may usually be determined if animals have had access to these baits.

Specimens to send.—If a post-mortem examination indicates that poisoning is the cause of death, then the following specimens should be sent:—From a ruminant, portions of the paunch and fourth stomach contents are all that are necessary. The paunch sample should be 1 to 2 lb. taken after the contents have been well mixed. Practically the whole of the fourth stomach content should be sent. These should be placed in separate clean tins or bottles and labelled with the name of the specimen and the owner's name and address and despatched to the

Under Secretary, Department of Agriculture and Stock, William Street, Brisbane. A covering letter, with full particulars of the symptoms and suspected cause of death, should be sent at the same time.

If an animal is sick, a sample of the fæces (dung) is useful for the detection of arsenic. The stomach content of dogs, cats, and other domestic animals is all that is necessary for chemical examination.

Preservatives.—No preservative is necessary if only stomach contents are forwarded. If organs such as liver and kidney are sent, a little coarse salt may be sprinkled over them if they are likely to be delayed in transit. About a quarter of a-pound of the salt should be forwarded in a separate packet for control analysis.

It should be noted that the foregoing refers to specimens sent for chemical examination and that organs are not required. These are unnecessary, unless legal proceedings are anticipated.

IRRIGATION WATER ANALYSIS.

Although the quality of well water may be suitable for irrigation purposes, it is frequently so high in saline content as to be harmful to growing crops.

The chief salts of well water are those of calcium, magnesium, and sodium. The most injurious of these is generally sodium chloride or common salt.

The quality of the water in some cases alters as pumping progresses, and where the early supply is known to be high in salt content it is advisable to have a sample collected after, say, two hours' pumping and have an analysis made.

This applies particularly to well water adjacent to the sea shore.

—S.J.K.

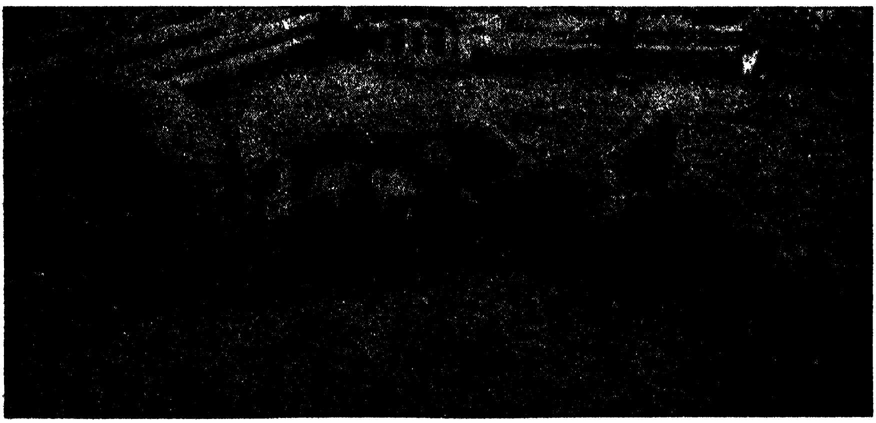


Plate 70.

BERKSHIRE SOW AND LITTER.

MARKETING

Pigmeat Plan Revised.

J. W. GARSDEN, Marketing Branch.

EVER-INCREASING demands for bacon and hams have been responsible for revision of the Pigmeat Acquisition Plan. This class of meat is particularly suitable for the Services operating in forward areas which are dependent upon canned and dehydrated meats and preserved meats in the form of bacon and ham for their meat supplies. Action has, in the circumstances, been taken by the Federal Authorities to restrict the sale of all pork, which now may only be disposed of at the direction of the Controller of Meat Supplies. Similar control is exercised over the sale of bacon and ham.

To encourage the production of baconer weight pigs the guaranteed price of pigs for bacon under the plan has been increased by 1d. per lb., bringing the price at export port for first quality to 9d. per lb., with second quality at 8½d., third quality 7d., and excessively overfat 6½d. The price for choppers will remain at 5d. per lb. The new prices, which became operative as from 6th September, are to apply until 30th June, 1945, and will be subject to 12 months' notice before alteration.

Concurrently with the increase in price the upper limit of the weight range of baconer carcases has been lifted from 180 to 200 lb. The Federal Authorities have also announced that steps are being taken to reduce the cost of wheat for feeding to pigs in the dairying areas to approximately 3s. 6d. per bushel, at the purchaser's siding. However, as the bulk of the wheat for Queensland pig feeders will require to be transported long distances, much of it from southern States, it is not known to what degree Queensland users will benefit.

At the beginning of August a ban was imposed on the slaughter of porker pigs of less than 100 lb. carcase weight. However, as many producers were holding porker types and were encountering difficulties in attempting to carry them to the minimum acceptable weight it was decided to accept porker pigs 100 lb. and under of export standard, i.e., pigs dressing out within the range 82 to 100 lb. and of export quality. Any rejected for export were required to be made available only to the smallgoods trade. The revised pigmeat plan contemplates that the restriction on killings of porkers, except for export, will be maintained and that the price of porkers from 82 to 100 lb. dressed weight will remain at 8d. per lb.

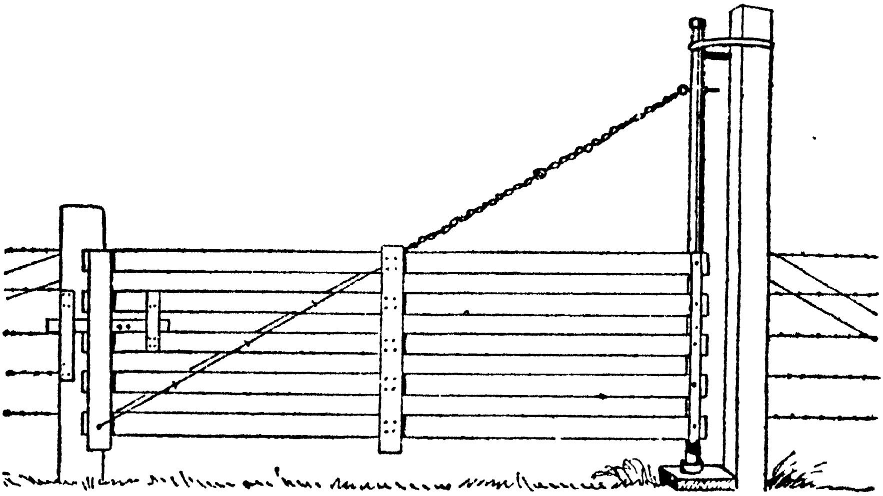
The plan as originally designed had as its main purpose the stimulation of the production of baconer pigs, and to this end aimed at giving stability to the industry. The alterations represent a step further towards this objective. It may be that other changes will occur, and, if so, announcements will no doubt be published in the Press.

Meanwhile there is an urgent demand for a big increase in supplies, and the plan contains an assurance to producers of a stabilised price for baconer pigs over an extended period as its basic principle.

GADGETS AND WRINKLES

A GATE WITHOUT HINGES.

The drawing suggests design, construction, and method of mounting a long gate so it will not prove too much for its hinges. A length of 2-inch pipe is used for the backbone of the gate. The bottom of this pipe pivots inside another pipe set into a concrete footing. The top pivots inside a strong strap-iron clevis at the top of the post.



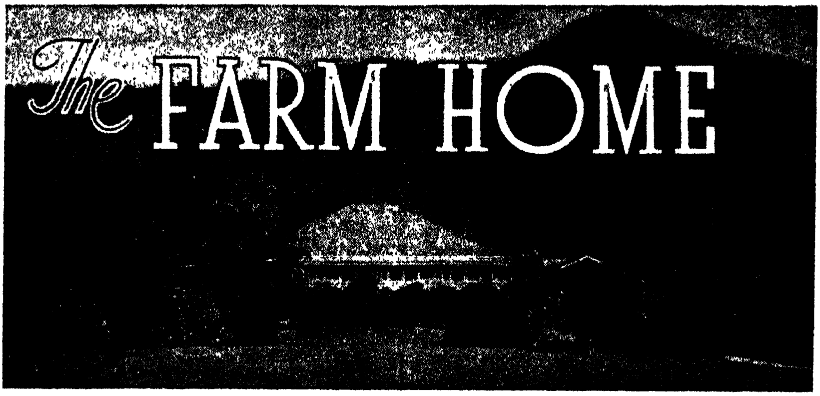
Other specifications differ from this gate somewhat to incorporate ideas used in a roadside gate. One idea is to have the gate shut against the post, rather than to clear it on the inside, and wide enough to permit passage of harrows, discs, and other implements, yet prevent its swinging into the road, where it might be hit by a car.

Four strands of heavy smooth wire may be used as a brace to prevent sag. A bolt near the bottom of the flying end of the gate makes it possible to loop strands to either bolt end, then pass them to the eyebolt through the pipe near its top. Wires may be adjusted to the right tension when the gate is new. Later, when it sags, the nut on the eyebolt may be turned down. Still later the wires above the gate may be twisted to remove additional sag if there is any. The distance between the eyebolt and the iron strap at the top should be enough to permit the pipe to be lifted out of its bottom bearing.

Heavy strap iron should be used, which should be shaped so sides from pipe to post are straight. A 2-inch piece of hardwood then may be cut to fit inside the sides of the strap, which may be drawn tightly against the wood with a bolt. A circular notch for the pipe will hold the top in place so it will not creep inside the iron strap and let the gate end drag when open.

NAILING WALLBOARD.

In nailing up wallboard covering three or four studdings to the sheet, drive a nail into each stud at the top of the sheet and then hang a plumb line or weighted cord the height of the wallboard on these nails. Nail down along the string.



Care of Mother and Child.

Under this heading is issued each month an article, supplied by the Department of Health and Home Affairs Maternal and Child Welfare Service, dealing with the welfare and care of mother and child.

BABY'S HEALTH: NATION'S WEALTH.

TO remain even for half an hour in one of our Welfare Centres is to be impressed by the number of beautiful babies there are. Bright eyes, sturdy limbs, pearly teeth—what an excellent start the children can have nowadays with baby welfare services, radio talks, newspaper and magazine articles all helping the mothers to become "baby-conscious"—to use a popular cliché!

What Becomes of Our Beautiful Babies?

In conversation with a young girl recently it was observed that she had at the age of about eighteen years a full set of artificial teeth, and she was complaining of the ache of her feet.

As Herbert Spencer—a well-known philosopher of the last century—said, "This failure to develop and grow up according to early promise causes no surprise or protest—we have got out of the way of expecting the average man or woman to have strong shapely feet, good limbs, deep chest, square shoulders, good muscles, graceful and easy carriage, and the aspect of radiant health and perfection that would be the prevalent type if man took as much trouble and care of his own species as he does about the rearing of cattle and horses. Deformed and crippled feet, spindly calves, indifferent bodies, shallow chests, round shoulders, and slouching gait characterise the majority. Our shortcomings are obvious even to the most casual observer, yet for the most part people regard the present state of matters as normal. There is no general protest against human unfitness. So long as people can manage to struggle through their daily work with the help of occasional patchings up by the doctor and the dentist it does not occur to them that any higher standard than this is to be expected."

This quotation from a writer of an earlier day can still be applied, unfortunately. Our hospitals are full, so many people go about "not feeling well"—the work of the chiropodist and dentist is increasing rather than decreasing.

In happier times we should have just seen the conclusion of the Brisbane Show—splendid specimens of cattle, sheep, horses, and other farms animals would have been admired by thousands of humans far less well favoured. These "beautiful baby" animals develop into perfect specimens of their breed. Why do we allow our beautiful babies to deteriorate into C.3 adults?

And yet children nowadays should have every opportunity of growing up physically fit. The commercial exploitation of children in factories is now a frightful memory of the past. The State provides for their education and has found that if a child is to learn properly some degree of physical fitness is necessary. Consequently, a school medical service and a dental service have been provided. With the wide scope of the Maternal and Child Welfare Service every mother in

Queensland may obtain help with her baby and child up to school age. Many mothers take advantage of this, especially in respect of advice and help with baby and his feeding, but a lot of mistakes in feeding are made after the baby is a year old and becomes a toddler. Then, again, there is the mother who does not seek help at all, because she has the mistaken idea that "mother knows best," and thinks that a quality vaguely referred to as "mother instinct" will compensate for a thorough knowledge of the correct way to build up the bodies and minds of her helpless little ones.

The revival of breast feeding and the greatly lessened use of artificial feeding during the first nine months of life has lowered the infant death rate in the first year of life by one half, and further progress in this direction would lower it still more. Unfortunately, many mothers plunge into trouble at weaning time, although an increasing number of younger mothers are learning to seek good advice at this time. All this is very hopeful, but there is another, darker side to the picture.

No competent observer can fail to observe the large number of poorly-nourished children. This is seldom due to poverty, but nearly always to want of knowledge, and may be frequently observed among children of the well-to do. These children are, physically, easily tired; mentally, either dull and listless or unduly irritable and excitable. They fall easy victims to every infection with which they come into contact. Such common infections as measles and whooping cough are not passed through lightly, but leave bad effects behind them. These children grow up candidates for tuberculosis or crippling rheumatism and other conditions of ill health, which fill up half our hospitals. At the root of all this trouble is a diet ill-balanced, unwholesome, and defective in vitamins. Constipation might be called a national disease. Whole industries flourish on this condition, yet of course it grows no less. These industries merely provide temporary aids for crippled bowels. Cripples are not cured by giving them crutches. The main cause of this condition again is defective diet.

School dentists, carefully examining the mouths of children as soon as possible after they enter school, have discovered the alarming fact that, on the average, only one child in ten has teeth without defect. For this again wrong diet is the cause. The diet of babies and their mothers is often deficient in the elements necessary for the development of sound teeth in the first place, and the diet of older children is such as readily destroys what teeth they have. However, it is encouraging to learn that in areas where child welfare centres have been established, and the mothers follow the advice they receive, the school dentists report a noticeable improvement in the children's teeth.

One hundred years ago the foods of our people were on the whole really good. Our grandmothers never worried about vitamins; they had never heard of them, nor had anyone else. But because they ate foods in their natural state they swallowed all the vitamins they needed. Since then our foods have been changed without our noticing it. They are called by the same names, we think they are the same, but some of them are comparatively worthless. New foods have become cheap and popular, though they are worse than worthless.

If parents do not wish their beautiful babies to grow into C.3 citizens they should learn all they can from people qualified to give advice about the feeding of their children from birth until they are fully grown, but especially during their first five years.

Questions on this and any other subject concerning maternal and child welfare will be answered by communicating personally with the *Maternal and Child Welfare Information Bureau*, 184 St. Paul's Terrace, Brisbane, or by addressing letters "Baby Clinic, Brisbane." These letters need not be stamped.

IN THE FARM KITCHEN.

The Makings of a Square Meal.

Economy Soup.—Wash well, scrub, and peel any vegetables it is desired to use (the actual vegetables can be cooked for one meal while peelings, &c., are used to make this soup)—potatoes, carrots, turnips, parsnips, onions, the strings from French beans, the pods of broad beans or young peas, the green tops or outside leaves of celery, a few outside leaves of cabbage, lettuce, silverbeet, or spinach, bacon or rind of bacon. Put them into a saucepan and cover with water, add small pieces of rind of bacon, also rinds of cheese; if no bacon rind is available, use salt or celery salt, a little pepper, 2 or 3 cloves (these may be omitted), some parsley, or a bunch of garden herbs. Simmer gently for about 2½ hours, strain through a sieve or colander

and serve. This is an excellent soup, very nourishing and good for children. Few would suspect its origin, as it is made from materials that are usually thrown away—hence its name. It may be made from the whole vegetables, but they should not be peeled. A tablespoon of wheatmeal or oatmeal added when partly cooked is an improvement, or a few crusts of brown bread. A spoonful of grated cheese sprinkled on a plate of soup adds greatly to its flavour and food value. Dried ends need not be wasted as it grates better when dry.

French Beans.—Slice the beans and put into a saucepan with a tablespoonful of butter and about half a cup of water, and a little salt. Steam very slowly until cooked, about three-quarters of an hour. Never use carbonate of soda when cooking vegetables; it destroys the nutriment and also the flavour.

Preparation of Bean Sprouts or Other Germinated Cereals.—Bean sprouts or other germinated cereals—useful and nourishing when it is difficult to get green vegetables. Soak some beans, dried peas, barley, or wheat, in cold water in a flat dish over night. Spread them out so as not to cover each other. In the morning drain off the water and cover with a double thickness of butter muslin or old linen, or cotton cloth (not flannel). Keep damp by adding a little water as needed. The sprouts will appear in about 48 hours. They are ready to eat when they are one or two inches long. Bean sprouts are palatable and very nutritious.

Boil or steam the sprouted seeds like any other green vegetable for 15 minutes, adding the salt when nearly cooked. For small children rub them through a sieve. For older children this is not necessary. Serve with white sauce or with a little butter.

Brown Stew.—1 lb. shoulder steak or neck of mutton, 1 oz. dripping, 1 onion, 1 oz. flour, 1 pint stock or water, salt, pepper. When fat is smoking hot, add onion chopped or in thin slices, and fry till brown and crisp, take out. Fry meat whole or cut up; when brown, take it out also; pour off any fat there may be in pan; mix flour, seasoning, and water, add; stir till it boils; add meat and onion. Simmer for two to two and a half hours. Neatly cut pieces of carrot, turnip and small onions, or other vegetables may be added.

Baked Liver and Potatoes.—½ lb. to 1 lb. liver, ¼ lb. bacon, 3 or 4 potatoes, ½ cupful stock or water, 1 dessertspoonful flour, 1 onion, 1 teaspoon dried sage or 3 sage leaves, salt and pepper, 2 teaspoonfuls dripping. Wash liver, dry, cut in slices ¼ inch thick, and dip it in seasoned flour. Cut onion and potatoes in thin slices, and the bacon in small pieces. Grease a pie dish, and put in the different ingredients in layers, having a layer of potatoes on top. Pour in the liquid, and put some pieces of dripping on the potatoes. Cook for about an hour. The tastiness and value of dish are improved if slices of tomato are added.

Bubble and Squeak.—Cook cooked cabbage and potatoes, slices of cold meat, pepper and salt; mix cabbage and potatoes together, season with salt and pepper, and fry nicely in hot butter or dripping, about 1 tablespoon; put into the centre of the dish; place in the oven to keep hot; cut slices of any cold meat, fry quickly and lightly; either salt or fresh meat may be used; place the meat round the fried vegetables, with a small roll of fried bacon alternately. May be served without meat.

Brown Pudding.—¾ lb. crusts bread, 1½ oz. suet, 1½ oz. sugar, 1½ oz. raisins, 1½ oz. currants, ½ teaspoon ground ginger, ¼ teaspoon ground cinnamon, ½ teaspoon bicarbonate soda, ½ teaspoon spice (mixed), milk to mix; an egg will improve the mixture. Weigh the bread and soak as long as possible in cold water. Squeeze dry, and crumble with a fork. Chop suet; clean the fruit. Mix all dry ingredients, except soda. Mix it with a little milk, and add to other ingredients. Steam in a greased basin 1½ to 2 hours, or bake in a greased dish in oven, sprinkling small pieces of suet or butter with sugar and cinnamon on the top.

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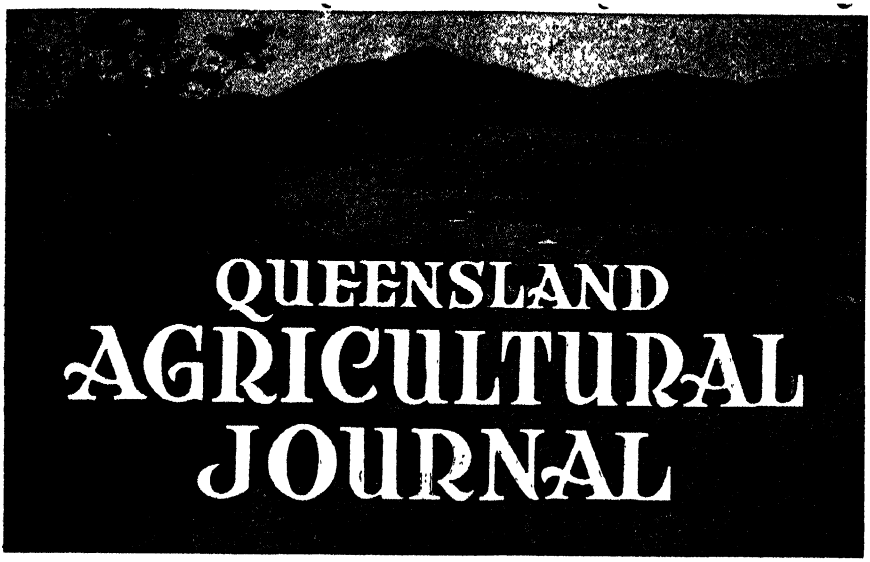

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Event and Comment.

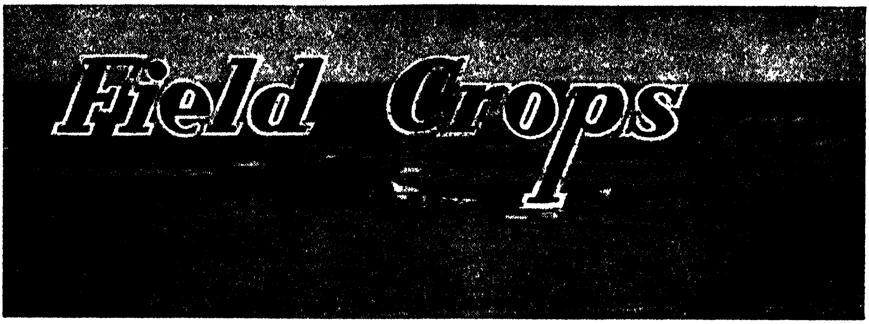
Women in Wartime Agriculture.

IN Queensland, as in the other States of the Commonwealth, the Women's Land Army is doing a splendid job and rural life will be the richer if many of the girls decide to stay in the country, and thus help in making the social life of the districts in which they settle. Members of the W.L.A. seem to merge unconsciously into their surroundings and so become an accepted part of the rural scene, as they are of agriculture's war effort. And the association of town girls with the practical side of country life will lead, no doubt, to a more complete understanding between town and country when peace returns.

Besides the Women's Land Army, there is the great unenlisted legion of farmers' wives and daughters who ever since the outbreak of the war have continued to share the burden of farm management without any distinctive uniform, or glamour. When the story of Australia's war effort on the home front is written, no finer section of the record will be that descriptive of the wartime work of the country women of the Commonwealth who have taken their part in every farm activity from planting time to harvest; who have carried on the seven-day routine of a dairy; and who, on pastoral holdings, have taken on the ordinary work of station hands, including fencing, boundary riding, and going on the road with travelling stock. The unenlisted legion of country women who are remaining on active service on farms and grazing selections while their men are on active service at battle stations has merited the finest tributes their fellow Australians can offer to them.

What Country Women Want.

MENTION of the wartime work of women in rural industry naturally suggests the need for a wider appreciation of the practicalities of country life, especially in relation to the farm home, when post-war planning is undertaken. It is the woman on the land who makes the farm home, and on her success in home making the smooth working of the farm as a business very often depends. Therefore, no scheme of rural reconstruction will be complete without full provision for modern amenities in the farm home and in country centres. It is suggested that among other amenities, three main services—water, sewerage, and electricity—should be a national responsibility. Better housing and furnishing and cheaper refrigerators also should be included in regional developmental plans. Modern transport providing the convenience and advantage of regular store deliveries to the farm home also should be part of a rural reconstructional programme. The advantages of modern education should be brought within easier reach of the farm family. There is no sound reason why the sons and daughters of the food producers should have fewer educational opportunities or facilities than city children. It is good to observe that with the extension of educational advantages, as provided for in recent legislation, there is a more general recognition of the importance of having a complete system of training available to every youngster in the community. Decentralisation of university tuition and technical training, with due regard always for the requirements of rural industry, is one of the clamant needs of country life. Country women want an educational system devised to meet the needs of the rural population, equally with that of the city. Furthermore, there are many country women themselves who feel the need of some specialised instruction in food preservation, home crafts, and other branches of rural domestic economy. When peace returns, such instructional courses might be provided wherever expert tuition is required. There also are many women farmers who would welcome simple instruction and information on the results of scientific research, and the application of scientific principles to small-scale agriculture. There may be a distinction between what country women want and what they need, but in a properly organised rural community there should not be any excuse for what may be described as mental starvation. Country women require opportunities for service in addition, perhaps, to ordinary social and patriotic activities; and opportunities for creative work. A complete educational system would supply all these needs, and among the first things regional planners might study are the things which country women want. Especially so if we accept the view that the land must contribute largely to the required increase in the population of Australia, without which all talk of reconstruction and new orders is empty, vain, and valueless.



Breeding Grain Sorghums for Queensland.

L. G. MILES, Research Officer, Biloela Research Station, Callide Valley.

SORGHUM, as cultivated for grain, is a crop of great antiquity and has been the staple food for millions of people in addition to domestic stock. The sorghum group is of wide distribution, the main centres of origin being South, Central, and Northern Africa and a belt from the Mediterranean region east to India, China, and Malaya.

Many varieties were introduced into the United States during the nineteenth century, but it was not until the early part of the present century that sorghum became an important crop in the dry south-west—the so-called "Southern Great Plains" area. All the original varieties were tall and the seedheads had to be harvested by hand; the heads were then fed whole or ground or were threshed in a suitable small-grain thresher. It was in America that dwarf types were first recorded, occurring probably as "sports" in the old standard varieties, and it was only when these dwarf strains came into large scale use that the possibilities of harvesting by machinery were first realised. At this stage, however, the most popular dwarf varieties, such as Dwarf Yellow Milo, were commonly irregular or goose-necked at maturity, and these characteristics made header harvesting difficult and wasteful. American breeders, therefore, set to work and crossed Dwarf Milo with straight-necked varieties, such as the Kafirs, and it was from such crosses that the well known header types—Wheatland, Beaver, and Kalo—were derived.

Sorghums were introduced into Queensland many years ago, and descriptions of grain types may be found in the "Queensland Agricultural Journal" as far back as 1916. It was not, however, until a range of the new dwarf types was introduced and tested that farmers became interested in sorghums as a major grain crop. In 1932-33 a large range of varieties was obtained by the Department from the United States, Egypt, and South Africa. These were grown under observation in the Mary Valley and at Brisbane, then liberated for more extensive testing in the Darling Downs, Callide Valley, and South Burnett districts. It is almost entirely on the best of these importations that the present grain sorghum industry of Queensland is based.

The two great advantages of grain sorghums in Queensland agriculture are—(1) their ability to produce a payable crop on a minimum of summer rainfall, and (2) their adaptability to machine harvesting. Sorghum has, on numerous occasions, proved capable of producing a useful crop of grain under conditions which have caused the complete failure of maize. Once established, the crop can withstand long periods

of hot, dry weather without permanent ill-effects. Plants remain almost dormant during the stress period and show remarkable powers of recovery when the water shortage is relieved. This factor alone is of great advantage throughout most of the sub-coastal agricultural areas of the State, where the uncertainty of summer rainfall makes maize a risky crop. The added advantage of mechanical harvesting is an obvious one, particularly in a wheat district such as the Downs, where headers abound. Even in a district such as the Callide, where winter grain crops are not widely grown, farmers have considered it profitable to purchase headers solely or largely for the purpose of harvesting sorghum.

Sorghum grain is used extensively in the United States for the feeding and fattening of cattle, sheep, pigs, horses, and poultry. Its main uses in Central Queensland, to date, have been for pig and poultry-feeding, while a portion of the crop is in demand for cattle-fattening and drought-feeding of sheep in the west. It is regarded as slightly inferior to maize for general feeding, but is still a very satisfactory grain, particularly when ground and fed with skim milk or some protein concentrate. Dairymen in the Callide have found it profitable to grow considerable crops for pig-feeding, supplemented by skim milk and sometimes by maize or a winter cereal.

Few, if any, crops have no drawbacks, and with sorghum the main trouble is caused by insect pests. In the inland districts the sorghum midge, a small, delicate, reddish bodied fly, is capable of causing serious losses of grain. In the more humid coastal districts severe damage to seed-heads is also caused by caterpillars, particularly those of the maize moth (corn ear worm) and the peach moth.

The commonly grown varieties at the present time are Kalo, Wheatland, Day Milo, and Hegari. Brief descriptions follow:—

Kalo is the most widely grown variety in the Callide Valley and has also attained considerable popularity in other districts. It is not a true dwarf, frequently attaining a height of 4 to 5 feet, but is harvested without difficulty by modern Australian headers. It is a prolific variety, capable of heavy yields under a wide range of conditions. The head is long and club-shaped, and with wide-row spacing may become very heavy. The grain is medium small and reddish-gold in colour with prominent dark spots and blotches. The "neck" is normally long, enabling a header to harvest the heads without taking any quantity of leaf. In addition, the foliage and stalk of this variety are palatable and afford useful feed for stock after the grain has been removed. Its one serious disadvantage is its inclination to lodge under certain combinations of soil and climatic conditions. On the heavy clay loams of the Callide flats lodging appears to be of minor importance and is frequently not experienced at all. On some of the more open softwood scrub soils, however, whole crops in heavy head have been known to go down and render the grain practically unrecoverable. Under such conditions shorter, stockier varieties will be experimented with.

Wheatland.—This variety, formerly known as Wheatland Milo, is one of the original header types evolved in the south-west of the United States of America. It is a short, stocky variety, which stools well and approximates 3 feet in height in this district. Heads are of a somewhat irregular cylindrical shape. The grain is of medium size (larger than Kalo), creamy-yellow tinged with gold, and normally with blackish hulls.

At the Biloela Research Station, Wheatland is a few days earlier than Kalo in its heading and maturity. This variety is strong in the stalk and has not been known to lodge, but in most seasons is not capable of the same yield as Kalo.

Day Milo.—This is a true dwarf, averaging little more than 2 feet 6 inches in height at this station, though late-planted crops elsewhere have been somewhat taller. In maturity, it is one of the earliest varieties tested here. Heads are normally smaller than those of Kalo and Wheatland and are typically oval in shape and very compact. The grain is large and attractive, golden-yellow in colour, with straw-coloured hulls. This variety, except in a short, favourable season, is inferior in yield to the other three described, but on account of its earliness is often useful for late planting.

Hegari is a leafy, spreading variety which stools prolifically and has been used frequently for grazing by sheep. It is likely to vary considerably in its appearance and in its period of maturity, depending largely on seasonal conditions. Height is generally 4 to 5 feet. Hegari has been fairly late in maturity in the Callide Valley, but given favourable conditions at heading time the heads all appear at once and at a very uniform level. Heads are numerous, and may be small to fairly large, but invariably shell out a high percentage of grain; the variety is thus capable of very good yields. Heads are irregularly oval and compact, with the grain bunched closely round the branches. The grain is of medium size, white with brownish red spots, and is very free shelling.

The main objects of a breeding programme at the present time resolve themselves as follows:—

(1) The maintenance of purity in the varieties now grown, and improvements if possible in yield and adaptation. Sorghum when grown in the field is partially cross-pollinated, and if different varieties are heading at the same time in adjacent areas contamination of the seed of both will readily occur. When one considers also the possibility of seed mixtures occurring in planters and harvesters it is readily realised that varieties can soon become very mixed. Continuous effort is therefore required in maintaining the purity of seed stocks from year to year, and small quantities of pure seed are therefore periodically liberated to farmers for replacement of seed stocks. In the process adopted (later referred to as pedigree selection) it is often possible, in addition to maintaining varietal standards, to actually improve the yield or other characteristics of the variety.

(2) The provision of a Kalo type with a sturdier stalk, which will not lodge as maturity is approached. This weakness of Kalo has been referred to, and any improvement in the standing ability of this variety would be a very welcome contribution to sorghum culture.

(3) The development of varieties more suited to humid districts, where grub damage is severe. Observations made by Departmental officers in coastal areas have indicated that loose, open heads are less subject to damage of this kind than the more compact heads of the commonly grown varieties. One of the objects of this work is therefore to provide a number of types with open panicles for testing in such areas.

The methods used to bring about these ends may be grouped under three heads:—

(*a*) *Introduction and testing of new material.*—Since 1933, considerable numbers of new varieties and strains have been introduced,

not only from other countries, such as the United States of America, but also from as near at hand as New South Wales. These strains are now being grown and compared with our standard varieties. Any which show some superiority over existing material will be more critically tested in properly conducted varietal trials, and if they maintain their good characteristics they will be multiplied and liberated to farmers.

(*b*) *Pedigree selection.*—This method, which is one of the fundamental principles of plant improvement, consists in selecting a number of individual plants (or heads) from a variety and growing the seed from each plant in a separate row the next season. The selected heads are covered with a bag prior to flowering, so as to ensure self-fertilisation. The progeny rows are then compared with each other and the best are retained, while the inferior ones are discarded. If some of the better rows still show variability, the process of "head-to-row" selection is continued until superior, true breeding strains are established. Where varieties have become mixed or contaminated this is the most effective method of getting back to the pure original type. It also provides an opportunity of isolating even better types which may have arisen through accidental crossing, or by "sporting" or some other means.

(*c*) *Hybridisation.*—When the desired combination of attributes (such as high yield capacity, shortness, strength of stalk, drought resistance, &c.) cannot be found in any one variety it becomes necessary to cross two or more varieties to bring about the desired result. Thus, if by selection a strain of Kalo cannot be obtained which will be resistant to lodging, the next step would be to cross Kalo with some variety with a stronger stalk. The progeny of this cross would be examined for types like Kalo but also possessing the stronger stalk. Selected plants would then go into a pedigree selection programme for a number of generations until the new type had been purified or fixed. Crossing or hybridisation if carried out to its conclusion is a long and difficult process, but its value lies in the fact that it can achieve results far beyond the scope of straight selection.

Each of these methods finds a place in the programme of grain sorghum improvement at the Research Station, Biloela. Thus, among more recent introductions, Ajax is a variety which has given consistently good results. It is a fairly tall, coarse variety, and rather late maturing. Its head is heavy and compact and the grain large and chalky white in colour. It has been equal to Kalo in yield over the last few years and in trials this year remained erect where Kalo and a number of other varieties were badly lodged. It will therefore be made available for trial on scrub farms where lodging is a serious factor. Another new introduction, which has been named Betty, is capable of heavy yields of large Milo type grain. It has a large, very open head, but is somewhat tall for header harvesting and is also subject to lodging on some soils. This variety will therefore be used in crosses with sturdier dwarf varieties.

With pedigree selection, although only two seasons have been completed, some rather striking results are already evident. Thus, in Kalo, at least three dwarf strains have been isolated from the general material. One of these strains was this year 12 inches shorter than the standard Kalo and was some days earlier in maturity. Its yield was equal to that of the parent variety under fairly good conditions on one part of the farm, while it outyielded its parent in an area where drought conditions were severe. Such strains, of course, require careful testing under a

fairly wide range of conditions before any definite superiority can be claimed, but on their first appearance they are at least promising. It is possible also that their shorter stature may be a factor in enabling them to stand upright on soils which favour lodging. They will therefore be watched with particular interest on farms on which standard Kalo is known to lodge badly.

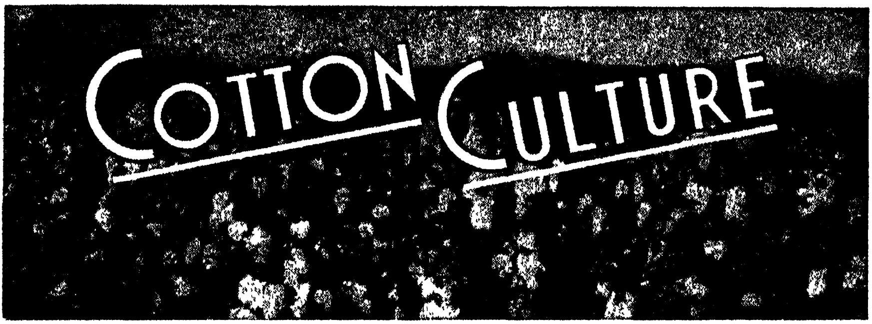
From Wheatland, also, a number of different strains have been isolated. The main difference here was in openness of head, some of the strains possessing a very loose, open head entirely unlike that of the original variety. It is not known yet how the new strains compare in yield with the standard type, though it appears that they are in the same general class. In any case, they will be worthy of trial in the coastal districts where grubs are an important pest.

Some of the newer varieties such as Ajax have proved extremely uniform, with the result that no improvement can be expected from selection. A number of others have shown both major and minor differences. Where the new strains prove inferior to the mean of the variety they are discarded, while those that show some promise are retained for further testing.

To date, only the first two methods of improvement, i.e., testing of introduced material, and selection in established varieties, have had an opportunity of yielding possible results. The third method, hybridisation, may require a period of five to ten years before new strains can be purified and finally tested. Only an indication will therefore be given of the crosses made and the purpose in making them. The two varieties Shallu (Egyptian Corn) and Betty produce a high yield of attractive grain in very open panicles or heads; the former, however, is very tall, and even the latter is taller than is desirable for header harvesting. Each of these has, therefore, been crossed with true dwarfs such as Wheatland and Day Milo with the object of combining dwarfness with the prolificacy and openness of head of the taller parents. Kalo has been crossed with Day Milo, with the object of breeding a Kalo type with a stronger and possibly shorter stalk. Schrock is another variety which has yielded well under local conditions, and possesses the added advantage of a good body of sweet, juicy leaf and stalk. Its disadvantages are its height (5 feet to 5 feet 6 inches), and the fact that its grain is brown and somewhat bitter like that of many of the tall fodder sorghums. It too has been crossed with a dwarf grain sorghum of good quality, in an endeavour to correct these faults.

It will be seen that the objects of the crossing programme in some respects duplicate those of the straight selection work. If the desired results are achieved through selection alone, there will be no need to carry the corresponding crosses through to finality. If, however, some of the newer selections represent only a partial solution to a particular problem, they will be used as stop-gaps pending the development of something better by hybridisation.

The foregoing is not intended as an account of a finished job, but is submitted as a progress report of breeding work at this station on a crop which promises to be of considerable importance to the State. As new varieties give satisfactory tests they will be multiplied for distribution to farmers.



Thinning and Early Cultivation of Cotton.

W. G. WELLS, Director of Cotton Culture.

FARMERS experiencing difficulties this season, brought about by either a loss of labour or by an expansion in their cropping programme creating a shortage of labour, may feel that they can omit thinning their cotton crop without reducing the yield. Many farmers who have grown annually large acreages of cotton have not thinned them because they planted at such a light rate of seeding that only a thin, irregular stand was obtained, which they felt could be left unthinned. If good growing conditions were experienced throughout the season these unthinned crops yielded fairly satisfactorily. If irregular growing conditions, characterised by either excessively wet or very dry periods occurring at critical stages in the development of the plants, were experienced, then both yield and quality of the crop frequently suffered severely. It is strongly recommended, therefore, that the cotton crop be thinned sufficiently to enable the plants to produce a satisfactory yield of good quality if suitable cultural methods are employed and very severe climatic conditions are not experienced.

In order to reduce the costs of both the thinning operations and the early cultivations it is urged that the suitability of the crop for cross harrowing be carefully tested. Where the stand of seedlings is thick enough, and the surface of the field is sufficiently free of trash and pieces of roots to allow of cross harrowing being done with a spike-tooth harrow, many bunches of the cotton seedlings can be eliminated by this operation without adversely affecting the stand. The removal of these excess plants prevents the development of the spindly type of growth, which usually occurs with too thick a stand of seedlings. Where the stand is good enough to allow of three or four cross harrowings being carried out, it has been found that only sturdy, well rooted, fairly well spaced plants are left at the last operation.

Sufficient evidence is not available to indicate whether the stand of plants remaining after a crop has been cross harrowed two or three times can be left without further plants being removed by hoe thinning. Generally speaking, it appears advisable to err on the side of wide rather than too close spacing. It is suggested, therefore, that where, after the last cross harrowing, the stand is still fairly thick or irregularly spaced, so that there is some degree of crowding, the excess plants be thinned out with the hoe to leave the plant spacing mostly used in the district for the particular soil type. The final thinning out with the hoe of any excess plants left by the cross harrowings can be done over a considerable period without adversely affecting crop development. The cross harrowings thus reduce the amount of hoe thinning required per acre

and also allow of this thinning being done over a longer period than normally, both of which are factors of great importance under present conditions.

Where either the stand of seedlings obtained is too thin, or the surface of the field is not suitable to allow of a cross harrowing being employed, it is strongly recommended that the plants be thinned out with the hoe to the most suitable spacing. Thinning in this instance should be commenced when the plants are about 5 inches tall and should be completed before they have exceeded 8 inches in height (Plate 71).

Plate 71.

A Field of Cotton in Good Condition for Hoe-thinning.—After the thinning is completed this field should be cultivated to establish a mulch around the plants. Note the light goose-necked hoe, which is the most suitable implement for hoe-thinning clean cotton.

The most suitable spacing of the plants depends on the type of growth which may be expected to develop under the usual range of climatic conditions experienced during the growth of the cotton crop. Where large plants can normally be expected, it mostly appears advisable to space out farther than where smaller plants are usually produced. Generally speaking, however, spacings of less than 12 inches and more than 24 inches do not appear to be advisable. The following single-plant spacings in rows 4 to 4½ feet apart are recommended:—

Central District—12 to 18 inches on the fertile soils and 18 to 20 inches on the less fertile, harder soils;

Upper, Central, and South Burnett—20 to 24 inches on the fertile soils and 18 to 20 inches on the less fertile soils;

Southern District—20 to 24 inches on all soils;

Western District—15 to 18 inches on all soils.

Early Cultivation.

Early cultivation of the cotton crop is particularly necessary under the climatic conditions of this State. In the districts south of Mackay, early planted cotton can be expected to produce better than cotton planted in late November or December. Most farmers in these areas plant their cotton following the first rains occurring after the first of October, and some farmers plant any time after mid-September, whenever suitable moisture is available. If the planting rains are rather light, planting is frequently done without a pre-planting harrowing in order to obtain the fullest benefit of the moisture present. Consequently, weed and grass seedlings may germinate at the same time as the cotton seedlings, and unless a cross harrowing is made before the latter appear a considerable amount of weed growth may occur in the row of cotton, especially if showery conditions follow planting. If the field is harrowed after the planting rain before the cotton is planted, and no further rain occurs until the cotton plants are of some appreciable size, no difficulty should normally be experienced in maintaining a clean crop during the early stages of cultivation. Many growers give the early planted cotton crop little attention, however, for some time after planting it, particularly if further rains are experienced, to permit the planting of other crops. This is most inadvisable, as there is always the danger of prolonged showery conditions occurring when the cotton seedlings are small; and unless the field is kept clean prior to this the resultant weed and grass growth may either cause the abandonment of the crop or greatly increase the use of hand labour to clean it. It is highly advisable, therefore, to maintain a clean field of cotton, particularly in its younger stages of growth.

Emphasis has already been placed in this article on the merits of cross harrowing to thin out the excess cotton seedlings, if conditions are suitable for employing this operation. It is also stressed that, if a

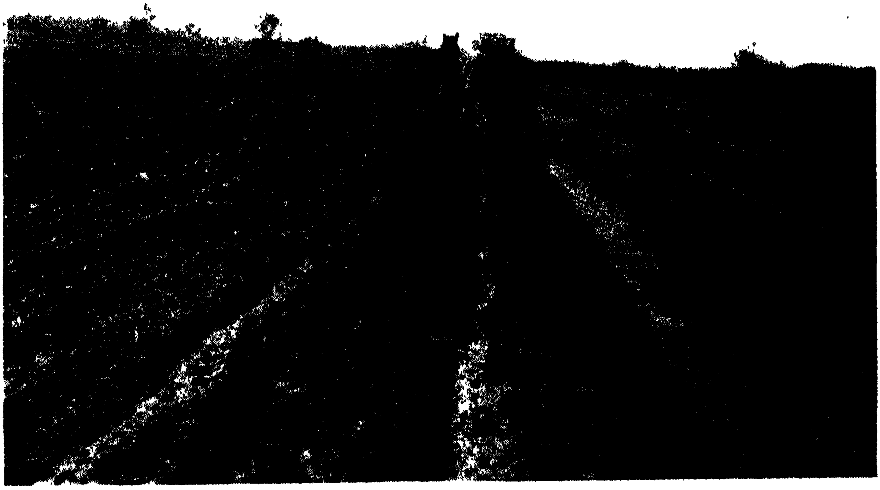


Plate 72.

Cotton Seedlings in a Suitable Stage for First Inter-row Cultivation.—Where the young cotton crop is not cross-harrowed, the first inter-row cultivation should be done when the cotton seedlings are 2 to 3 inches high.

sufficiently thick stand of cotton seedlings is obtained to allow of three or four cross harrowings being given, with the first one done as soon as the cotton seedlings are 2 or 3 inches high, the amount of the usual inter-row cultivation and chipping with the hoe generally required to keep cotton clean in a showery spring can be most appreciably reduced. Cotton growers should definitely pay more attention to this aspect of their cultural operations.

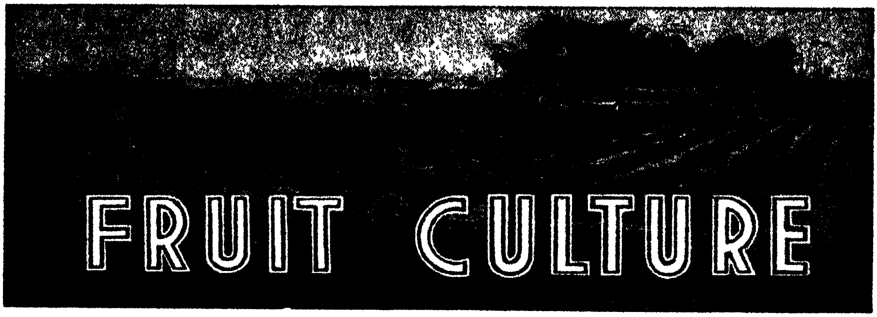
Where it is found that cross harrowing cannot be practised, then the usual method of inter-row cultivation, for which the farmer is equipped, should be employed as soon as the rows of cotton are discernible (Plate 72). This operation will destroy any weed and grass seedlings germinating between the rows at the same time as the cotton. A similar cultivation should be given following each storm occurring during the early development of the cotton crop. This procedure will not only allow of efficient control of weed and grass growth between the rows being obtained, thereby making more of the moisture present in the soil available to the cotton plants, but the maintenance of the mulch on the surface of the soil will increase the penetration of each rain experienced. It is pointed out, however, that where a disc cultivator is used in cultivating young cotton the small ridge of soil and plants formed by the discs cutting the soil away from it should not be left with the sides exposed for a lengthy period of dry weather. The ridge will dry out and set so hard under such conditions, particularly if a heavy storm preceded the cultivation operation, that the growth of the young plants will be retarded.

A considerable acreage of cotton is ploughed out each season through the crops becoming over-run with grass and weeds. Undoubtedly, much of this could be avoided if all growers maintained clean cultivation in the early stages of growth of their cotton crops. It is appreciated that, with the present labour position on many farms, it will be difficult to maintain a satisfactory state of cultivation by ordinary methods. It is strongly recommended, therefore, that cross harrowing be employed wherever possible, for a marked reduction in labour requirements to cultivate and thin the cotton crop can be effected thereby.

INSECT PESTS AND PLANT DISEASES.

—oOo—

Will readers please note that VOLUME III.—INSECT PESTS AND PLANT DISEASES—of the **Queensland Agricultural and Pastoral Handbook** Series, is now out of print. A revised edition is now in course of preparation for early issue.



The Avocado.

R. L. PREST, Fruit Branch.

THE avocado, originally indigenous to Mexico, has been cultivated since time immemorial. It very early spread through Central America, Peru, Antilles, later to Brazil, and in 1871 was established in California, where, during the past twenty-five years, avocado growing has been built up to a stabilised industry.

Its time of introduction into Queensland is somewhat obscure; there are, however, records of seedlings over thirty years of age, many of which are still fruiting. In recent years, budwood and grafted trees of promising varieties have been imported from the United States, whilst selections of locally raised seedlings of excellent quality have been made.

Botanical Status.

Botanically, the avocado belongs to the genus Persea, and is a member of the laurel family. The early classification of the avocado

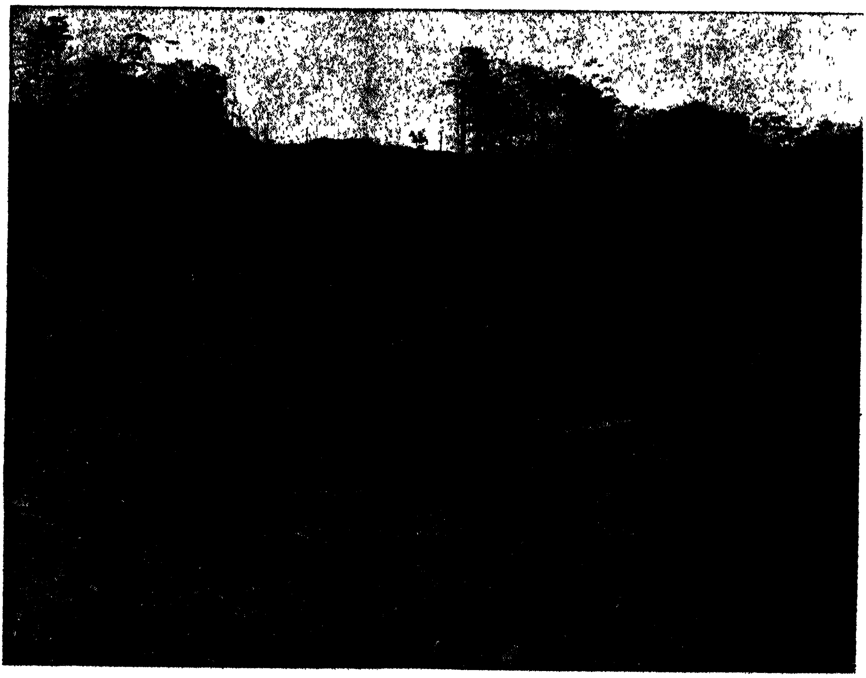


Plate 73.
A SMALL SOUTH COAST FOOTHILLS PLANTATION.

grouped all varieties in one species—*Persea Americana* Mill. There are, however, three ecological or climatic races—Guatemalan, Mexican, and West Indian.

Guatemalan Race.—A highland type, the fruit of which matures during winter and spring and possesses a woody, granular skin of comparative thickness.

Mexican Race.—A highland type, the fruit of which ripens during summer and autumn, is small to medium in size and thin skinned. The strong aniseed aroma given off by the crushed leaves is commonly used for identifying the members of this race.

West Indian.—Tropical lowland type, the fruit summer and autumn maturing, medium in size, with skin of medium thickness and of a leathery texture.

The avocado is an evergreen, though some varieties are virtually leafless for a short period during blossoming. The habit of growth is variable, some trees being tall, upright, and unbranched, while others are small, well branched, and spreading. The leaves also vary considerably in size and shape. The young foliage often exhibits various shades of red and bronze, but when mature is usually deep-green in colour.

The fruits of different varieties vary greatly in size, shape, and colour. In shape they may be round, oval, pear-shaped, or any graduations between these forms. The colour may be bright yellow, green, dark green, maroon, purple to purplish-black.

Plate 74.
YOUNG AVOCADO TREE, "NABAL."

Food Value.

At present the avocado is principally used as a savoury, but as its general food value becomes more appreciated it will undoubtedly find a much larger place in the diet of the general public. In addition to its use as a savoury, its nut-like flavour and creamy consistency has been found to blend with other dishes, such as ice-cream, egg-nog, and salad dressing. These innovations should enjoy popularity when the avocado can be placed on the market in sufficient quantity and at a price within the reach of all.

The vitamin content of the avocado must be considered high, as it is an excellent source of vitamin B. Vitamin A is also high, whilst the vitamins C, D, and F have been noted to be present.

It is high in fat content, protein, and minerals, which suggests that it contains nutriment values far exceeding those of other fresh fruits.

Plate 75.
"NABAL" AVOCADO FRUITING.

Adaptability to Queensland Conditions.

The commercial culture of the avocado can be carried on within certain limits in our tropical and sub-tropical coastal areas. Trees planted in the foothill districts along the North and South Coast, and in Northern Queensland, have grown vigorously, and some are now in heavy bearing. Whilst at the present juncture large commercial plantings are hardly warranted, smaller plantings as a side line are worthy of every consideration. Its climatic requirements are similar to those of citrus. This, however, can only be taken as a general guide, for in practice it has been found that the avocado is more susceptible to low winter temperatures, and, in addition, during the blossoming period, variable weather conditions, such as changes from fine to wet or from warm to raw and cold, considerably interfere with the normal blossoming. Briefly, the climatic factors limiting its commercial culture in Southern Queensland, and to be guarded against as far as possible, are—

(*a*) Low winter temperatures;

(*b*) High spring and summer temperatures;

(*c*) Low atmospheric humidity during the blossoming and fruit-setting period;

(*d*) Heavy winds.

Soils.

In Queensland, the avocado is thriving on a comparatively wide range of soils. Loams, sandy loams, and sandy soils are all regarded as suitable.

In considering the question of soils, although chemical properties are of importance, suitability largely depends on the physical properties, such as porosity and aeration on which depend good drainage; good depth is also important.

Some of the loams of basaltic origin on the coastal ranges and the sandy loams along the foothills of these are excellent soils for avocados. The more sandy soils, reddish to brown in colour, vary in physical properties. They are often too well drained, especially where they immediately overlie a sub-soil of gravelly wash and, unless they can be well irrigated, are best avoided. However, where the sub-soil at 18 to 30 inches deep is of a heavier nature and a deep red in colour, they should prove suitable. Heavy clay soils and the grey sands found in low-lying areas should be avoided.

The ideal soil for avocados is a loam of medium texture overlying a medium but porous sub-soil which, in turn, overlies a gravelly wash. In no circumstances should trees be planted on poorly-drained soils, as the roots are extremely sensitive, and the trees quickly succumb to "wet feet."

Propagation.

As seedling avocados cannot be relied upon to produce fruit true to type, the planting of trees worked from varieties of known performance is advocated.

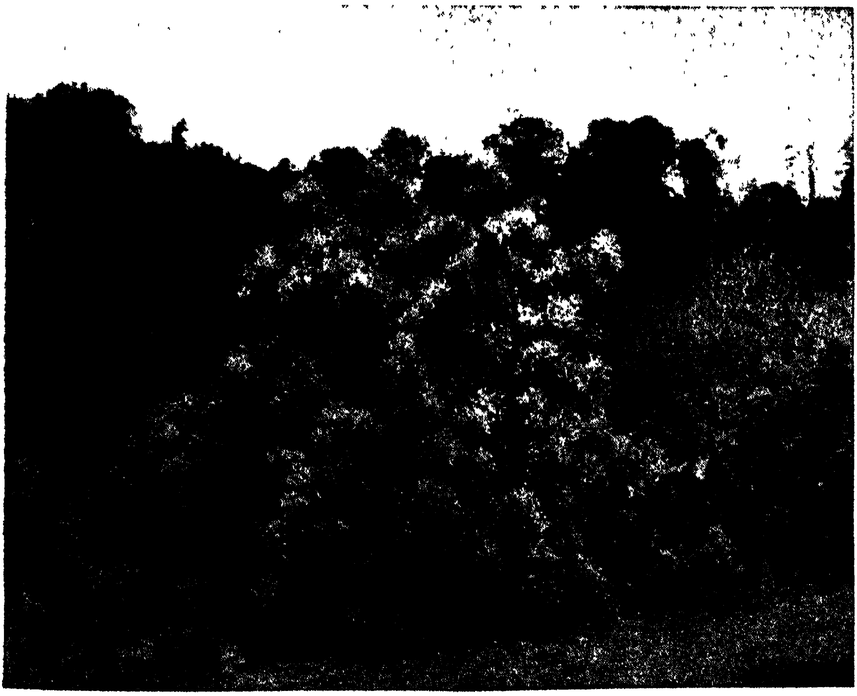


Plate 76.
AVOCADO TREE IN BLOSSOM.

Seeds for the propagation of avocado trees should be selected from properly matured fruits from healthy and vigorous seedlings, and should be washed, cleansed, and planted as soon as possible after removal from the fruit. They may, however, be held, if necessary, for several months without apparently impairing germination, providing care is taken to prevent them drying out.

Plate 77.
"FUERTE" TREE.—Note straggling type of growth.

Germination may be induced by planting the seed in tins, seed boxes or seed beds. A mixture of equal parts of clean sand and loam is used. The seeds are placed in the soil with the base down and with the apex just protruding above the surface. The soil should be kept moist but not soaked. During hot weather shading will be necessary; hessian or lath screens are useful for the purpose. Under favourable weather conditions, germination will take place within a few weeks.

When grown in a seed bed, the seedlings should be transplanted to nursery rows upon attaining a height of 6 to 8 inches. When lifting, care should be taken to prevent root damage, because avocado seedlings have a particularly long tap root.

In the nursery row, the plants are set out at 12 to 18 inches apart in the row, and the rows 30 to 36 inches apart. Immediately after planting the seedlings should be watered to prevent wilting. Temporary protection from the sun is necessary; shading on the north-east side is particularly advisable. Frequent waterings are again necessary, but soaking should be avoided.

When the stocks have attained a diameter of about ⅜ of an inch at their base, and the sap is flowing freely, they may be budded. This is usually done during the autumn or spring, but it may be continued as long as the sap is flowing very freely. When the stock is ready to receive the bud, a "T" cut is made in the bark, preferably 6 to 8 inches above ground level. The perpendicular cut should be from 1½ to 2 inches in length and just through the bark to the cambium layer in depth; damage to the cambium should be avoided. The "T" cut should be made preferably on the south side of the stock, for on that side the bud will not be so exposed to the sun.

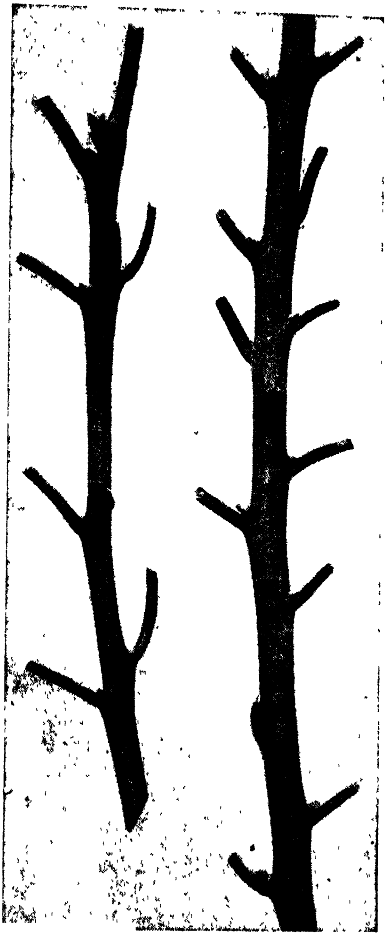


Plate 78.
BUD STICKS.

Budwood should be carefully selected from branches of recent growth which have been permitted to mature. The terminal growth should be rejected and either of the two previous growths used. Budding avocados has been found to require rather more care than is required with some other fruits, because, while the union of the stock and scion takes place readily enough, the bud often fails to grow, and the eye falls out. It is necessary, therefore, to select only the plump full buds in the middle of the bud stick. Buds at the top of the stick rarely develop, while those at the base are inclined to shed the eye. If required, budwood may be stored for from four to six weeks by packing it in trays in moist sphagnum or peat moss. Actually, storing is of advantage in as much as buds which may be over-developed are shed and the bud stick may then be rejected.

Before the buds are cut from the bud stick the leaves should be trimmed off, leaving a piece of the leaf stalk or petiole to permit of easier handling after the bud has been cut.

The bud may be cut either from above or below, the general practice being from below the bud upwards, commencing from ¾ inch to 1 inch below the bud and ending from ¾ inch to 1 inch above it. The cut should be made with a sharp, thin-bladed knife and just deep enough to remove a thin layer of wood. Where the removal of the wood can be done without injury, the chances of a successful union are increased.

The bud is inserted in the "T" cut in the stock and gently pushed down between the bark and the cambium layer. In order to bring the bud and stock into close contact, the two are then bound closely together with raffia. About three weeks are required for the bud to unite with

Plate 79.

BUD INSERTED AND TIED.

Plate 80.

BUD SHOOT SUPPORTED BY TIE.

the stock, and during this period the tie should be inspected frequently, and where bulging appears the tie should be loosened to prevent restriction.

As soon as the union takes place, the stock may be headed back a few inches in order to force the bud into growth. The ties should not be removed from the point of insertion until the bark flaps have entirely healed over, which should take place in from six to eight weeks after budding.

As soon as the bud has made 3 or 4 inches of growth, it should be tied to the stem of the stock and later trained to a stake. The final removal of the stock stub may be done when the bud shoot has reached 12 to 18 inches in length and has become somewhat hardened and capable of remaining erect. The cut is made at a slope just above the union, and should be sealed with some sutiable substance such as Bordeaux paste or lime sulphur.

Pollination.

Studies of avocado blossom behaviour in Queensland has adduced evidence similar to that obtained in other avocado-growing countries, and suggests that mixed plantings of certain varieties of different groups are essential to ensure satisfactory cross pollination. These blossom studies have demonstrated that avocado flowers have two distinct opening periods, one during the morning and one during the afternoon; and all varieties observed can, as regards flower-opening periods, be grouped into two classes, which, for convenient reference, have been designated groups "A" and "B."

At the first opening of the flowers, all the stamens are spread out in a nearly flat plane (Plate 81), and the stigma is then receptive. On the second opening the inner whorl of stamens, three in number, are folded about the style (Plate 82). The outer whorl of stamens (six) do not open widely as at their first opening, and do not fold inwards until the pollen has been discharged and the flower is about to close. The time of discharging is indicated by the opening of small lids or valves on the anthers. On the second opening of the flowers, the style appears to have elongated and the stigma is elevated above the anthers. The pollen appears as a sticky mass.

Plate 81.

AVOCADO BLOSSOM.—First opening period (receptive). Note that stamens are spread out in a flat plane.

Plate 82.

AVOCADO BLOSSOM.—Second period opening (pollen shedding). Note in whorl stamens folded about style, also small anther lids opened signifying the discharge of pollen.

Observations have shown that the flowers of varieties of group "A" open for the first time in the morning when they are receptive. They close usually between noon and 2 p.m., and open a second time during the afternoon of the following day, when they shed pollen. On occasions, a part of the third day may be required to complete the cycle. The flowers of varieties in group "B" open for the first time in the afternoon when they are receptive, and open a second time the following morning when they shed pollen.

Sudden changes of weather conditions from fine to wet, raw, or cold, upset the normal floral cycle, delaying the flower opening, and restraining the regular functioning of the floral parts. Sometimes up to eighty hours are required to complete a cycle in both "A" and "B" groups.

As has been stated, all the varieties so far studied fall into these two groups ("A" and "B"), shedding their pollen for the most part at different hours of the day; and from this it is probable that varieties selected from these two groups and interplanted will enhance the opportunities for fruit-setting.

So far, the undermentioned varieties growing in Queensland have been studied and placed in the groups "A" and "B":—

Group "A."		Group "B."	
Anaheim	G	Cambelli	H
Benik	G	Fuerte	H
Dickinson	G	Ganter	M
Karlsbad	G	Nabal	G
Mayapan	G	Northropp	M
Princess	G	Panchoy	G
Puebla	M	Queen	G
Spinks	G	Tamborine 68	G
		W.P.I.	M

The letter following the varieties denotes the race; G. Guatemalan, M. Mexican, and H. those considered to be of Hybrid origin.

Varieties.

In selecting varieties for trial plantings, some of the desirable characteristics to be considered are:—

(1) Hardy and vigorous-growing trees.
(2) Regular and heavy croppers.
(3) Uniformity in size and shape of fruit.
(4) Quality of fruit which should be fleshy, free from fibre, and of a rich nutty flavour.
(5) Seeds should be small and tight in the cavity.
(6) Thickness of skin. A thick skin is desirable, although it makes maturity more difficult to determine. Early thin-skinned varieties are susceptible to damage by fruit fly.
(7) Synchronisation of blossom periods of the varieties planted.

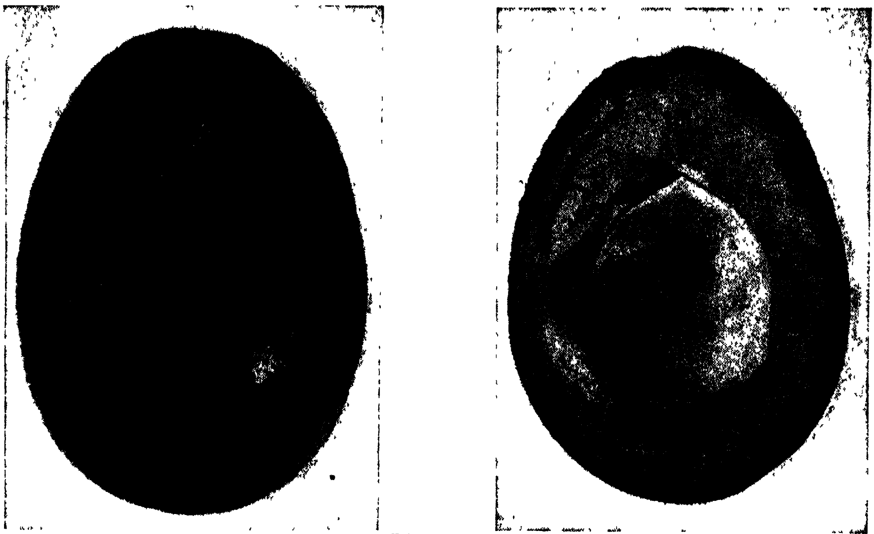


Plate 83.
ANAHEIM.

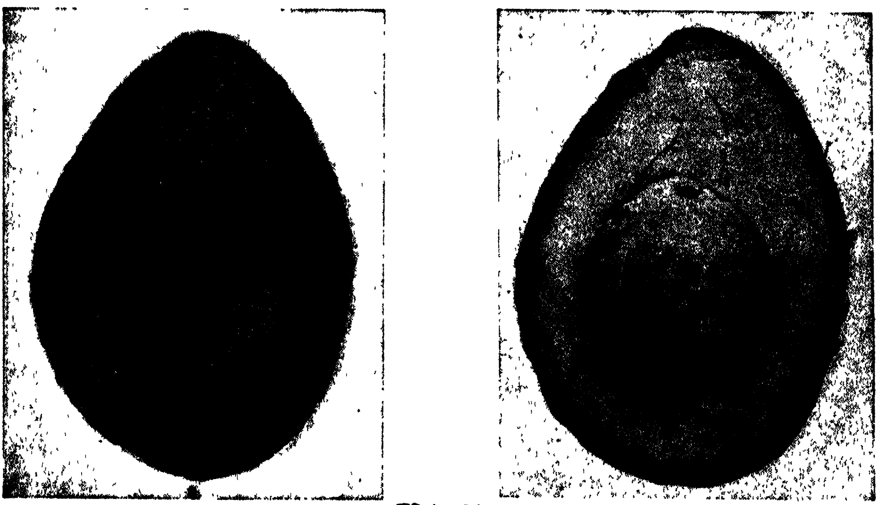


Plate 84.
BENIK.

The study of varieties is as yet far from complete, and it is quite possible that at a later stage new names will be added, whilst some may have to be removed from the following list. In these descriptions allowances should be made for normal variation in the fruits and the season of maturing, which will differ to some extent in different localities.

Anaheim (Guatemalan).—Tree tall with upright growth, blossoms mid-season (September to October), a prolific bearer though the fruit is easily shed; fruit elliptical; skin rough, glossy, green; flesh creamy; flavour good; seed medium size and tight in cavity; matures during July and August; pollination group "A."

Benik (Guatemalan).—Tree spreading, well-branched; blossoms mid-season September and October; fruit pear-shaped; skin inclined to be rough, maroon purple; flesh creamy-yellow; flavour good; quality excellent; seed small and tight in cavity; matures September to October; pollination group "A."

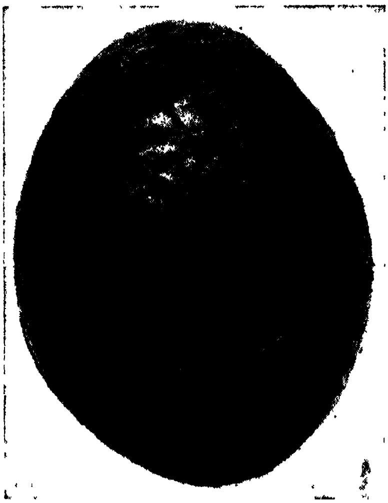


Plate 85.
DICKINSON.

Dickinson (Guatemalan).—Tree well-branched, spreading, blossoms mid-season: fruit oval to pear-shaped, apex rounded, surface roughish; purple; skin thick; flesh buttery, pale yellow, pleasant flavour; good quality; seed roundish flattened at the poles, tight in cavity; matures September and October; pollination group "A."

D.C. 68 (Guatemalan).—A Queensland seedling raised by Messrs. D'Arx and O'Conner, Tamborine Mountain. Tree large, well-branched, blossoms mid-season; fruit pear-shaped, shiny green in colour, the skin medium, smooth granular; flesh pale yellow, buttery texture, slight fibre, flavour good; seed medium, firm in cavity; matures September; pollination group "B."

Fuerte (Hybrid).—Tree straggling, spreading; blossoms very early July and August; fruit pear-shaped, oblong, base somewhat pointed, apex obliquely flattened; green with numerous yellow dots, pebbled; skin thin, pliable, leathery; flesh creamy-yellow, greenish near skin, texture buttery, very rich flavour, quality excellent; seed tight in cavity; matures April and May; pollination group "B."

Mayapan (Guatemalan).—Tree rather upright, well branched; blossoms late October and November; fruit almost round, smooth, dark purple; skin thick, granular; flesh creamy yellow, buttery texture; flavour good; seed rather large, tight in cavity; matures September and October; pollination group "A."

Nabal (Guatemalan).—Tree well-branched, spreading; blossoms late; fruit almost round, smooth, green in colour, skin thick, granular;

flesh creamy-yellow, buttery texture, greenish near skin; flavour exceptionally good; quality excellent; seed small, tight in cavity; matures October and November; pollination group "B."

Queen (Guatemalan).—Tree well-branched, spreading; blossoms late; fruit oblong, pear-shaped; skin rough, deep purple, thick and woody; flesh rich yellow, greenish near the skin; flavour rich, quality good; seed small, tight in cavity; matures October; pollination group "B."

Spinks (Guatemalan).—Tree well-branched, spreading; blossoms late; fruit broadly obovate; surface rough, somewhat warty at the base,

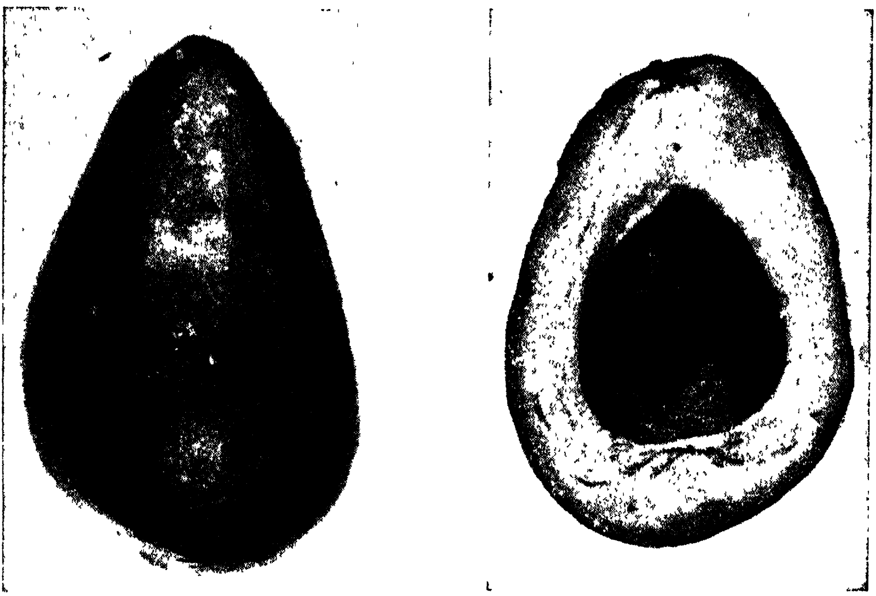


Plate 86.
FUERTE.

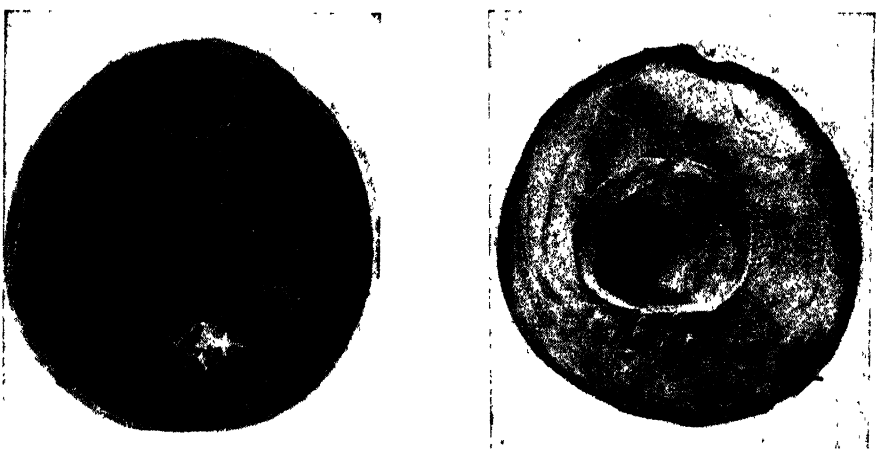


Plate 87.
NABAL.

dark purple; skin thick, woody, granular; flesh firm, smooth, creamy; flavour pleasant, quality good; seed large, tight in cavity; matures October and November; pollination group "A."

Wilsonia (Guatemalan).—A Queensland seedling raised by Mr. J. Wilson, Hunchy; tree well-branched, spreading; blossoms early August and September; fruit oval, dark-green in colour; smooth skin, thick, shell-like, granular, woody; flesh creamy coloured, greenish near skin; flavour good; seed medium large, firm in cavity; matures July and August.

Plate 88.
QUEEN.

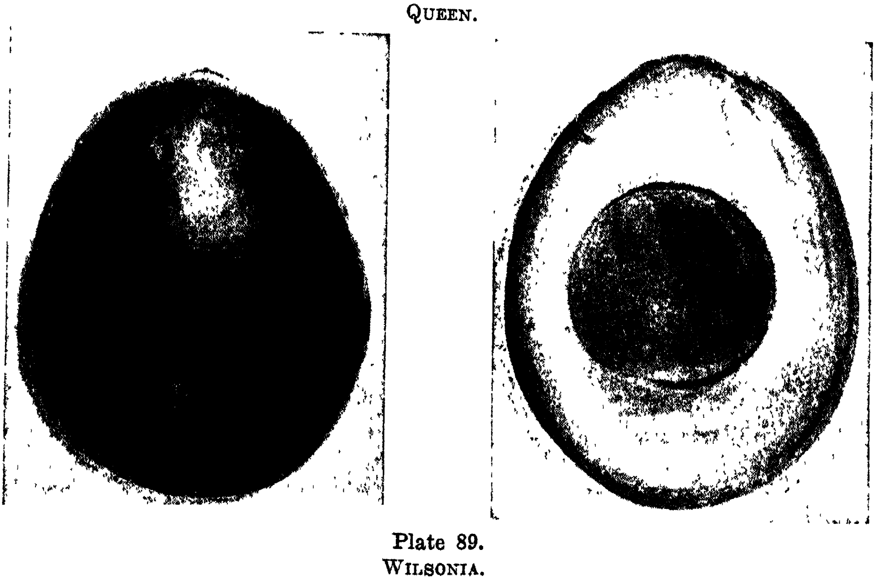


Plate 89.
WILSONIA.

Vegetable Production

Lettuce-growing.

C. N. MORGAN, Fruit Branch.

LETTUCE during the last few years has become one of the major vegetable crops of districts adjacent to Brisbane. Until recent times the main sources of supply were Chinese market gardens which were chiefly situated in low-lying alluvial ground adjacent to swamps or small creeks near the cities and various large towns.

With the increase in demand, growers with reliable irrigation and with various types of soil experimented with small areas until they found methods and varieties to enable them to produce good quality lettuce all the year round.

The introduction of the Imperial strains of lettuce produced by the late Dr. Jagger of the United States Department of Agriculture has done much to establish the industry in this State. They have shown considerable disease resistance and have stood up to the varying climatic conditions much better than the older varieties. The large well-formed heads of these types are particularly popular on the Queensland market.

Climate and Soil.

Generally speaking, lettuce are grown more successfully during the cooler months of the year, and although affected by heavy frosts this condition is rarely a source of worry in the Queensland lettuce producing districts. Under certain conditions, however, it is grown all the year round, the chief factors in the warmer months being reliable and constant irrigation and the use of a suitable variety. During the summer the plants do not produce a distinct heart as they do in the winter, and although the heads are large they would be classed as loose-leaved. In the warmer weather, unless grown quickly, the lettuce will rapidly run to seed. Almost any well-drained soil, providing it is supplied with adequate moisture and plant food, will grow good lettuce. Different methods of growing may be necessary, such as the hilling up of heavy soils to ensure drainage, particularly during the periods of excessive rains.

Manures and Fertilizers.

As lettuce are heavy feeders it is necessary to ensure that the soil is well supplied with plant food. A number of large growers are fortunate enough to have ample supplies of farmyard manure which is particularly suitable for lettuce and aids in the supply of organic matter without which the growing of lettuce is difficult. Unfortunately, the manure is not available for all growers and therefore the use of commercial fertilizers has become extensive.

The main fertilizer used is blood and bone, which is applied to the ground a week or so prior to planting. Although various methods of application are employed a number of successful growers broadcast the fertilizer and plough or cultivate it in. Where rotary hoes are in use they prove a reliable means of incorporating manure or fertilizer with

the soil. Amounts used vary according to soil requirements and usually from ten (10) cwt. to fifteen (15) cwt. per acre has proved sufficient. During growth, top dressing of the growing crop is often necessary and nitrogenous fertilizers are the most satisfactory. Sulphate of ammonia, nitrate of soda or dried blood are all used, depending on the grower's particular fancy. Two applications are usually considered necessary, but in some cases one is sufficient when a heavy base dressing of fertilizer or manure has been used. The first top dressing may be done soon after thinning, and the second a little later, when the plants are nearly half grown. Top dressing should not be done when the plants are hearting or in the summer, when nearing maturity, as it tends to produce loose heads. When applying the top dressing the fertilizer should not be allowed to drop on the leaves as it may mark them, and as a precaution after top dressing it is a good practice to water, to wash off any fertilizer that may have fallen on the leaves. The total amount of top dressing should not exceed four hundred (400) lb. per acre.

Following constant use of sulphate of ammonia and manures, liming of the ground is often necessary but should not be overdone. It is commonly considered that large quantities of lime are required for successful lettuce-growing, but on many types of soil, excessive liming is not of any advantage and may even have a retarding action on growth. However, it is necessary on soils with a highly acid reaction, when good results will follow. Certain cases have been encountered where lettuce on soils of high acidity would not grow and showed many stunted and yellow patches, but when grown on the same soil after liming, have shown considerable improvement. A slightly acid soil is probably the best and, therefore, if growers should be doubtful as to their soil condition, a sample should be sent to this Department, where it will be tested for acidity and the correct amount of lime needed to correct any excess will be advised.

Rotation.

Rotating lettuce with other types of vegetables is advised, but due to the position and extent of the most suitable land this is not always possible.

A number of farmers are constantly growing lettuce on the same ground successfully, with no apparent ill effects. In most such instances, however, these growers have available large quantities of farmyard manure which keeps the soil in good condition, replacing in it the materials, particularly organic matter, which are apt to be depleted. In soils that are at all heavy, constant watering tends to make the soil organisms inactive, and a rotation with a crop not so exacting in its water requirements allows the soil a chance to dry out partially. Rotation is also advisable to aid efficient control of disease. Green manure crops as a means of improving soil condition are recommended, particularly where growers do not use farmyard manure.

Soil Preparation.

All land for lettuce, whether heavy or of a sandy nature, must be thoroughly prepared. Two, and on certain types of soil three, ploughings are necessary, followed by harrowing and cultivating until such time as the soil is in a fine state of tilth. The sandy loams are much easier to prepare than the heavy clay loams. When planting direct into the field it is essential to have the land as level as possible and free of lumps, and this can be brought about by the use of a float. This float (Plates 90 and 91) is easily made out of weather boards approximately

3 feet long nailed across two strong supports, the thick portion of the board overlapping the preceding narrow portion about ¾ inch. The length of the float may be approximately 4 feet and a chain for pulling attached to the front of the supports so that the thick edges of the planks are drawn against the lumps.

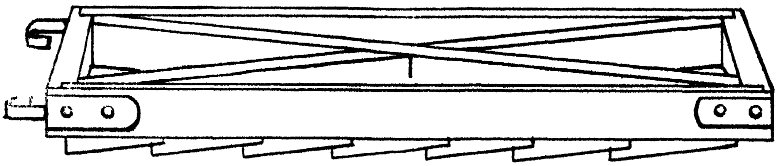


Plate 90.

WOODEN FLOAT.—Note placing of weather boards to act as levellers.

Growers may modify the above sizes to suit their particular requirements. With two horses the size may be increased accordingly and should be sufficiently wide to fill in the hoof marks. Diagonal stays help to make the float more rigid. The driver may stand on the float, supplying any additional weight required.

Planting.

Before the general use of small mechanical seed planters and irrigation, it was customary to grow the lettuce seed in beds and transplant to the field. Owing to losses in transplanting and the tedious work this practice has been largely replaced by planting seed direct into the field.

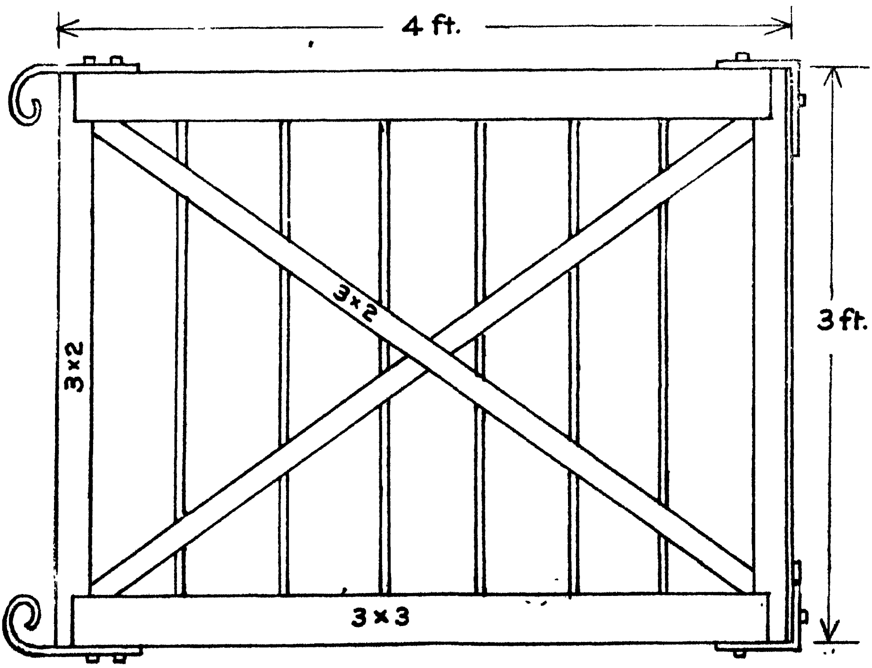


Plate 91.

TOP VIEW OF FLOAT.—Plan showing method of strengthening.

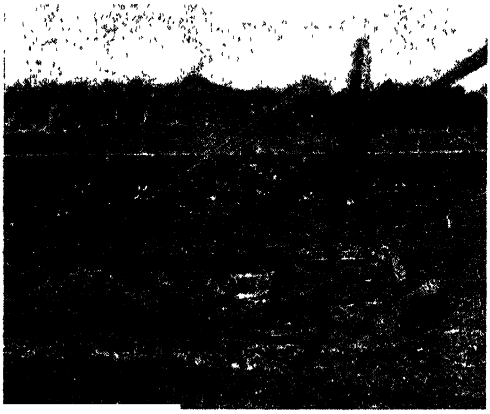


Plate 92.
SCUFFLER WITH "HILLER" ATTACHED TO REAR FOOT.

Plate 93.
"HILLER" FOR ATTACHING TO SCUFFLER.

Two methods of planting are usually adopted. The first is to plant on to raised beds sufficiently wide to allow four rows approximately 12 inches to 15 inches apart. The method of making the beds is to throw in two furrows approximately 6 feet apart, either by means of a single furrow plough or a hiller attached to a cultivator, as illustrated in Plates 92 and 93. The latter method is simpler and quicker. The beds may then be levelled by raking or by a float. The method of raising the beds is employed on heavy or shallow soils to improve the drainage (Plate 94).

The second system is to plant direct in the field without hilling, and is employed on the well-drained sandy types of soil (Plate 95). Rows are made about 15 inches apart, and this distance allows the use of a hand cultivator. Should horse cultivation be contemplated, which is most unlikely, rows will have to be up to 2 feet apart.

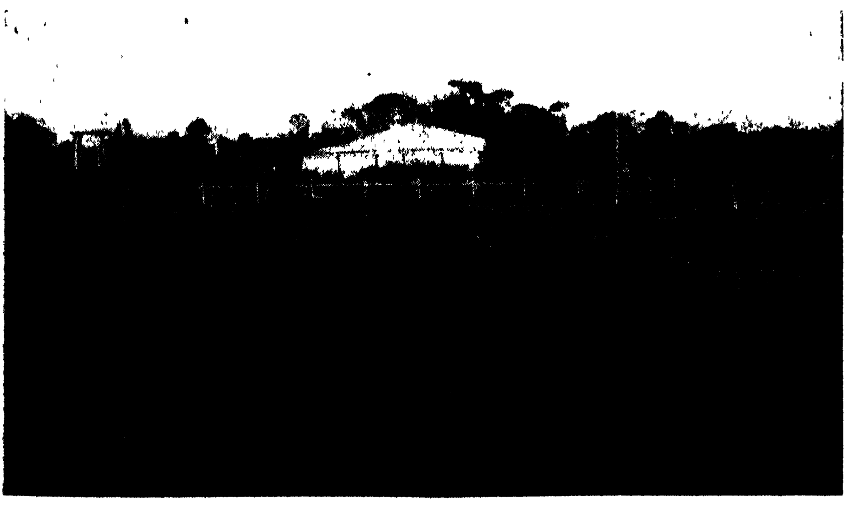


Plate 94.
SOIL HILLED UP READY FOR LEVELLING.

Plate 95.

Lettuce Planted on the Flat.—Recommended only for naturally well-drained soils.

With both methods the seed is drilled out so that it is dropped continuously along the row and must be sown shallow. Thick seeding should be avoided as the work involved in thinning is laborious and expensive and much seed is wasted. From 1 to 1½ lb. of good seed should be sufficient to plant an acre when using a planter (Plate 96),

Plate 96.

Mechanical Planter.—Controls distance and depth when planting seed, also marks distance apart of rows with adjustable arm projecting from right of machine.

more being required when planting by hand. If there is any doubt of the seed or conditions affecting germination as much as 2 lb. is not excessive. Successive plantings may be done of areas large enough to conveniently handle at periods of approximately seven days apart. Lettuce usually take from eight to ten weeks from seed to reach market condition, depending on the time of the year and climatic conditions.

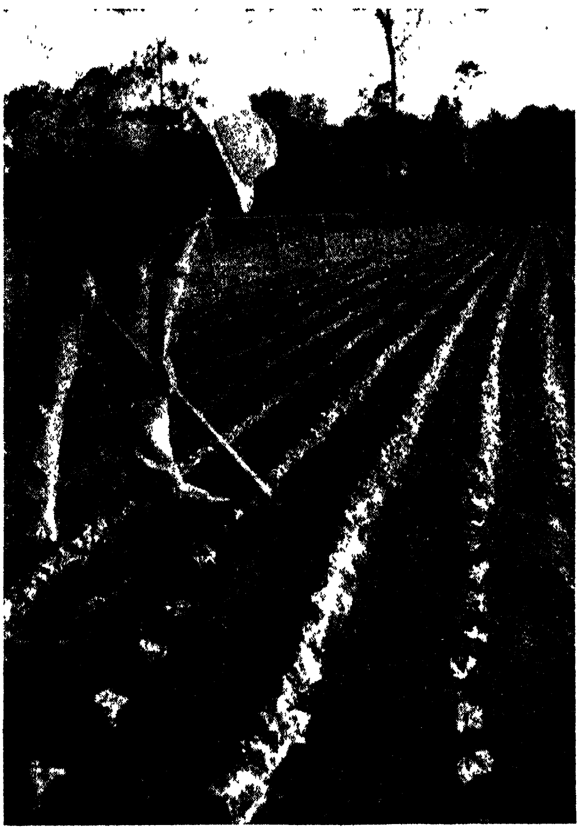


Plate 97.

THINNING YOUNG LETTUCE WITH A SMALL HOE.—Notice the unthinned row in the centre.

Thinning.

Approximately three to five weeks after planting, depending on location and time of year, the plants should be large enough to thin out. They are usually thinned to about 9 to 10 inches apart. This can be done by hand or with a small hoe (Plate 97). The latter method is effective, and with practice the grower becomes most skilful. Obviously, with the use of the hoe, many small clumps will be left at each required distance and these may then be thinned by hand. Should there be any misses in the row, they may be filled in by some of the thinned plants.

Cultivation.

Cultivation should be fairly constant and in no instance should weeds be allowed to get too big, as the lettuce is a shallow-rooted plant,

and great injury will result in the removal of big weeds. Small hand cultivators may be used to keep down weeds between the rows. In the rows chipping is necessary; if the lettuce are grown quickly, two chippings should be all that is required. One is usually done at thinning and the other a few weeks later. Cultivation should be fairly continuous, but never too deep. During cultivation is usually a satisfactory time for top dressing as the fertilizer is then worked into the soil.

Plate 98.

LETTUCE HALF-GROWN.—Planted 12 inches by 10 inches on raised beds. This area is irrigated with an overhead system.

Irrigation.

Practically all lettuce are irrigated by overhead sprays, and this method is quite satisfactory (Plate 98). If the ground is fairly dry it is advisable to water well a few days prior to sowing. After sowing, the ground should again be watered and then kept moist until the plants are through. Lettuce requires a plentiful supply of water, particularly during the warmer months, when evaporation and transpiration are high. Lack of moisture results in stunting and slow growth of the plants, and in the warmer weather causes them to run to seed prematurely. Soil and climatic conditions have a bearing on any set programmes of watering, and therefore no hard and fast rule can be laid down to cover the various types of soils, but all must be kept moist by regular waterings.

Saturation of soils is undesirable and should be carefully avoided, as far as practicable. This condition often occurs during the rainy periods and irrigation must be carefully planned in an endeavour to avoid watering heavily when heavy rain is likely. During the winter months irrigation is done sparingly, and normally no great effort on the part of the grower is required to keep an even supply of soil moisture during this period. In the summer, however, the position is quite different, and full use of irrigation facilities is necessary.

The well-drained sandy and volcanic soils require much more irrigating than the heavier ones. With the former types it will commonly be necessary to water thoroughly every second or third day. When the longer interval is employed, it will be to advantage to give light waterings in between to keep the soil in as cool a condition as possible. On the heavy soils, one good watering followed by two light waterings each week should be sufficient. Modifications of any programme may be necessary, of course, with any sudden change in climatic conditions, and growers should not blindly follow any particular practice merely because good results followed it in a former season.

Overhead watering during the heat of the day is not recommended and it should be done early in the morning or at night. As the heads reach maturity and the plants spread between the rows they shade the ground and thereby lessen evaporation, with the result that they are not in need of such consistent watering as they were in their earlier stages. Therefore, should a grower find his irrigation supply likely to be slightly below his requirements, losses will be far less probable in lessening the water on the near-mature plants than half-grown ones.

Plate 99.
LETTUCE READY TO HARVEST.

Harvesting.

Lettuce should be harvested as soon as they have reached maturity (Plate 99). If allowed to remain they rapidly become bitter and unpalatable. Winter lettuce are mature when the hearts are firm, and if picked before this do not keep or travel satisfactorily. Summer lettuce, being loose-leaved, may be cut when they reach reasonable market size. In an endeavour to obtain large lettuce in the summer care must be taken to see that they do not start to run to seed, for when this occurs they are commercially valueless. Harvesting extends over a period of days, as it would be a rare case to have all the lettuce from the same planting ready within a day or so of each other. Cutting is done either late in the afternoon of the previous day or early on the

morning of the day of marketing. The former practice is quite satisfactory in the winter, while the latter is more desirable in summer. A pamphlet on lettuce packing for market is procurable on application to this Department.

Varieties.

The most popular varieties are the crisp, curly-leaved lettuce. Various varieties are grown, but the most satisfactory at present are:—

Imperial 847.—This variety is by far the most popular and may be grown in most localities all the year round.

Imperial 615.—This variety is grown to some extent in the winter and is a particularly good lettuce. It is not recommended for the warmer weather.

New York.—This variety is still grown in some localities for the winter, but has been replaced by Imperial 847 for the warmer months.

Seedless.—This variety is popular with a number of growers during the hot months of the year. It is lighter in colour than most of the above varieties but is large and is in good demand.

Mignonette.—A small variety of good flavour, and is recommended for home gardens. It is not a market variety, being too small, but will grow well at any time of the year.

GARDENING REMINDERS.

Green crops already in the ground should be kept growing. Cabbage, lettuce, and silver beet will be more tender for being stimulated by liquid manure. It should be remembered, though, that liquid manure should not be applied if the soil is dry. The soil should be well watered first and the liquid manure given afterwards.

Pumpkins and marrows may take up too much space in a small garden, but if there is plenty of ground they should certainly be grown. They are easy to grow, and the vines may be trained to advantage over a low fence. The pumpkin and its relations like a rich soil, so plenty of animal manure may be dug into the bed. Two or three vines will produce all the pumpkins an average household would use. The fruit should be allowed to ripen on the vine, and if picked when properly ripe they may be stored for a long time. Queensland Blue is a good variety.

When watering the vegetable garden it should be remembered that one soaking every week is better than a sprinkle of spray every day. Shallow watering is often a waste of water, as soil surface evaporation is very rapid, and the roots of the plants get little or no moisture at all. What garden soil requires is a good wetting, even down to the depth of a foot, as most plant roots go down so far, and some may even penetrate further.

The Value of Bird Life on the Farm.

HUBERT JARVIS, Research Officer.

MANY farmers fully appreciate the importance of bird life on their properties and accurately assess the part which the more commonly encountered species play in the control of insect pests. Unfortunately, however, others sometimes judge individual species of birds by their more conspicuous behaviour which earns praise or condemnation not always justified by a careful survey of their feeding habits. This may explain the endless disputes in rural circles as to the value of birds to the farmer.

In order to settle such controversies and to obtain an accurate estimate of their value, the feeding habits of a considerable number of birds have been studied in detail. This is not a difficult matter, for an examination of the stomach contents of a reasonably large number of individuals in each species gives a good indication of its food preferences and also suggests when and how, if at all, it may be prejudicial to the farmer's interests.

Plate 100.

TERNS IN FLIGHT.

[Published by permission of the Queensland Government Tourist Bureau.

Many birds feed almost entirely on insects, others on seeds, some on fruit and nectar, and a few on carrion. Not many are restricted to a single article of diet and, if the preferred food is not available or is in short supply, they may display unusual feeding habits. Some of their depredations on the farm and in the orchards are due to this cause. Again, the type of crop grown on the farm often supplies large quantities of cereals or fruit similar to the native foods to which the bird is accustomed, and it is not surprising therefore that crops are sometimes attacked. A number of birds also show undesirable habits which bear little or no apparent relation to their feeding and nesting requirements.

The following brief review of some common birds will indicate their varied feeding habits and also their importance to the farming community.

Feeding Habits of Native Birds.

Of the three species of **ibis** in Queensland, the commonest is the straw-necked ibis, so-called from the long, straw-coloured plumes which flank the white neck. Large numbers occur in coastal and inland swamps where breeding takes place and from which they fan out in all directions seeking food wherever it can be found. The long, downwardly-pointed bill is particularly suited to foraging in the ground for white grubs and other subterranean insects, and the typical "auger" holes made when the bill is inserted into the ground are

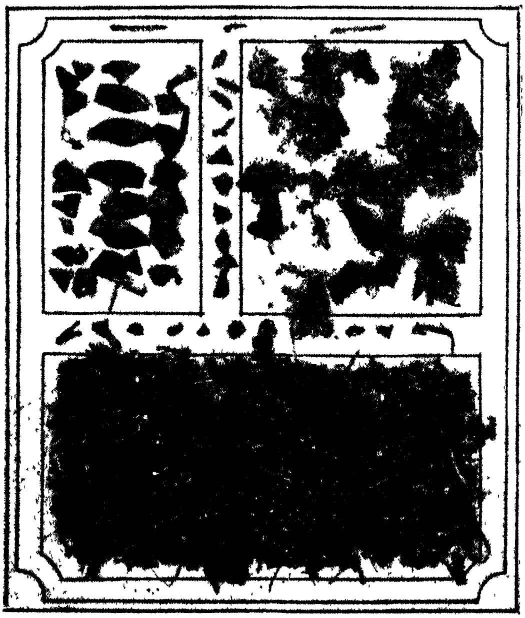


Plate 101.
STOMACH CONTENTS OF IBIS.—Dragon fly larvæ and water bugs.

well known in volcanic, red soils where white grubs are sometimes a serious pest of pastures. The diet includes a variety of other insects however, these being chiefly of the type which tends to aggregate in swarms. Grasshoppers and army-worms thus provide part of the

diet, so much so that the whereabouts of these insects can often be determined by merely noting the paddock or part of a paddock in which ibis congregate from day to day.

The **frogmouth** with its very wide gape, from which comes the name, is a large, dark, sombre-looking bird whose colour matches the dead branch usually selected as a perch. Somewhat owl-like in appearance, it also resembles this bird in its night-feeding habit, though, unlike the owl, it feeds almost entirely on insects. These include the large cicadas whose shrill chirrup deafens the ear in the gum-covered country where they occur, phasmids—long, grotesque-shaped insects with flattened, leaf-shaped limbs—and the large scarabæid beetles which congregate in great numbers in the vicinity of trees after spring storms.

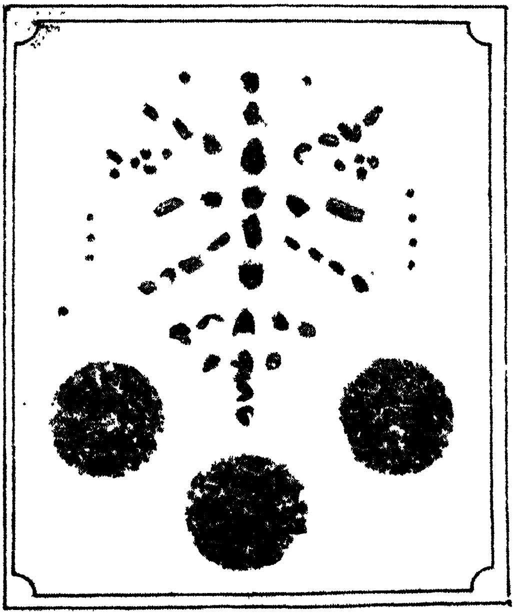


Plate 102.

STOMACH CONTENTS OF MAGPIE LARK.—Beetles, ants, and small seeds.

The **magpie lark**, known from its characteristic shrill cry as the "pee wee," is a moderate-sized, black and white bird often seen in recently ploughed land searching for white grubs, wireworms, the pupæ of cutworms and army-worms, and other insects. It is also credited with an appetite for the small snails in which the organism responsible for liver fluke in sheep spends part of its life. Though occasionally feeding on broadcast grain in and near fowl runs, it seldom, if ever, attacks field crops.

The **flycatchers** include a number of very active, fan-tailed birds with a sober-coloured plumage. The two best known are the restless flycatcher, commonly termed the "scissor grinder" from the noise made when it is hovering in the air, and the brown flycatcher, frequently given the colloquial name, "Jacky Winter." All the fly-catchers have similar feeding habits and subsist almost entirely on insects. These are mainly flies and small beetles which fall easy victims

to their rapid, yet well-controlled, feeding flight. This is seen to advantage in the Willie Wagtail, so often perched on cattle, from which it darts to and fro to capture bush flies, stable flies, and March flies.

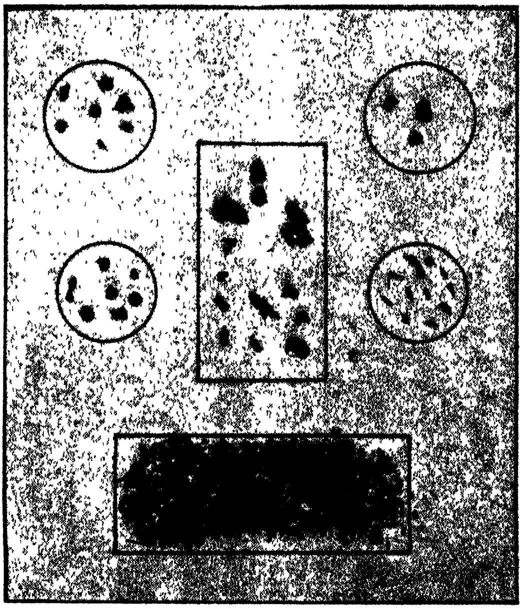


Plate 103.
STOMACH CONTENTS OF FLYCATCHER.—Beetles, ants, flies, and cicada.

Woodswallows, though not real swallows, derive their name from the typical, swallow-like flight which is frequently seen near the edges of clearings and over the tops of trees. Some species are migrants and only visit Queensland during the summer months. All are insectivorous and capture wasps, bees, and similar insects on the wing. Unfortunately, they sometimes nest near an apiary and attack the bees as they enter and leave the hive. In a short time they can seriously weaken the strength of the colony and, as the honey production from the hives is determined by the number of worker bees available to collect nectar and pollen, they may cause considerable loss to the beekeeper. Another bird with very similar habits is the familiar bee-eater known to most apiarists in the Eastern States.

The **cuckoo shrikes** and related caterpillar eaters are all insectivorous, the latter being the more familiar because their pugnacious habits so often attract attention during the mating season. Though shy, they are not infrequently seen in fields where cultural operations are in progress. They are not restricted to white grubs and other insects in the soil, however, for grasshoppers and army-worms form an important part of their diet.

A variety of small birds occurs in shrubby timber along the banks of creeks and among leafy saplings in open, forest country. They include the **thornbills,** the **babblers,** the **tits,** the **wrens,** the **finches,** and the **robins.** Normally hunting in pairs or small groups, they seldom fly far from the nest and are typical of the vast number of

midgets in the bird world which feed almost entirely on insects. Each has its preferences. Some seek out aphids, others favour scale insects, while small caterpillars are destroyed by most of them. It is probable that the absence of these birds from some built-up areas in the city is one contributory cause to the heavy scale infestation in shade trees and ornamental shrubs.

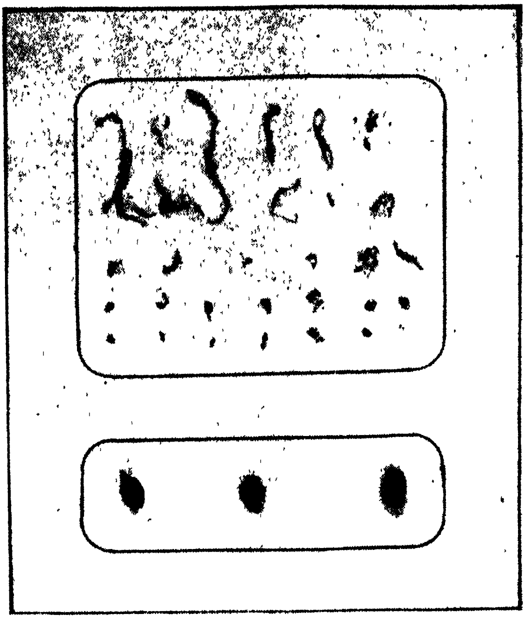


Plate 104.
STOMACH CONTENTS OF CATERPILLAR EATER.—Caterpillars, crickets, cicadas, and odd seeds.

The commonest of the true **owls** is the Boobook or mopoke whose eerie hoot can be heard almost anywhere in the bush at night. Like all owls, it has an aloof, cadaverous appearance quite in keeping with its nightly habit of preying on small birds, mice, and some of the larger insects. The insects include grasshoppers and several large beetles, some of which are of interest to the farmer as occasional pests of field crops and shade trees.

Crows, currawongs, and **magpies** are large, black or black and white birds found in forest country which is fairly well covered with timber. Crows feed mainly on insects, but they are also partial to carrion and occasionally to grain. They are particularly valuable in pastoral areas on account of their scavenging habits, though they sometimes attack the eyes of aged sheep and weak lambs, and are then a nuisance to the grazier. In agricultural areas they may invade grain crops, but seldom on a scale beyond the farmer's power to deal with it. The currawong moves about in small groups though these may merge and become fairly large colonies when food supplies are abundant in the one place as, for example, when the larger grasshoppers invade subcoastal and pastoral areas. Other insects in their diet are wasps, ants, and beetles. Native fruits are also consumed, and at times the currawong may be troublesome in orchards when the fruit is ripening.

The magpie tends to be more solitary than the currawong, and is perhaps best known for its pointless habit of uprooting seedlings both in the field and in the nursery. The vice has no obvious connection with the search for food.

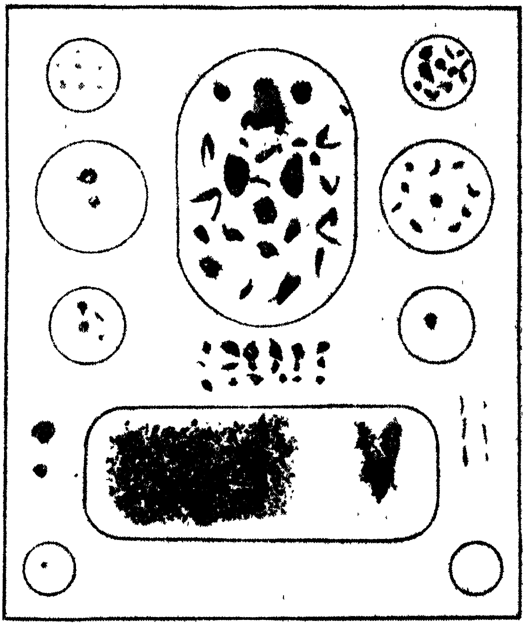


Plate 105.
STOMACH CONTENTS OF CURRAWONG.—Beetles, ants, wasps, snail, and vegetable matter.

The **hawks** and the related talon-footed birds of prey are well represented on the farm by the common brown hawk and the Nankeen kestrel. They prefer a varied diet containing insects such as cicadas and grasshoppers, small birds, rodents, marsupials and lizards. Owing to the acquired habit of attacking and carrying off chickens from unprotected fowl runs, the brown hawk has a bad reputation. Actually, however, insects and rodents which are undesirable on the farm provide the bulk of its food.

Parrots, cockatoos, galahs, and **parrakeets** include some of the most useful as well as some of the most destructive birds found on the farm. The black cockatoo is usually restricted to scrub or rain-forest areas where it occurs in small flocks which feed on the larger borers found in dead and dying trees. To get at these insects, the bark is stripped and torn aside by the powerful beak. The white cockatoo is fond of grain and in some parts of the State raids maize paddocks when the crop is maturing. It is very shy and not easily lured within gun range. Some galahs are also very partial to grain crops and present a troublesome problem in grain sorghum areas, particularly where the area planted is small and their feeding is therefore not dispersed over a considerable acreage.

The **kingfishers** are, for the most part, vivacious birds with a highly-coloured plumage. Most of them occur in the vicinity of water, but they range far afield in search of food. The best-known member

of the group is the kookaburra, which is commonly found in open forest country. Though fond of insects such as white grubs, weevils, and grasshoppers, they also eat lizards, small snakes, and mice.

Honey eaters are small, slender, and often brilliantly-coloured birds which abound in flowering eucalypts, tea trees, and Banksias. Though feeding primarily on nectar and pollen, they capture large numbers of the smaller insects associated with the flowers such as ants, bees, wasps, and flies. Occasionally they also attack the softer, cultivated fruits.

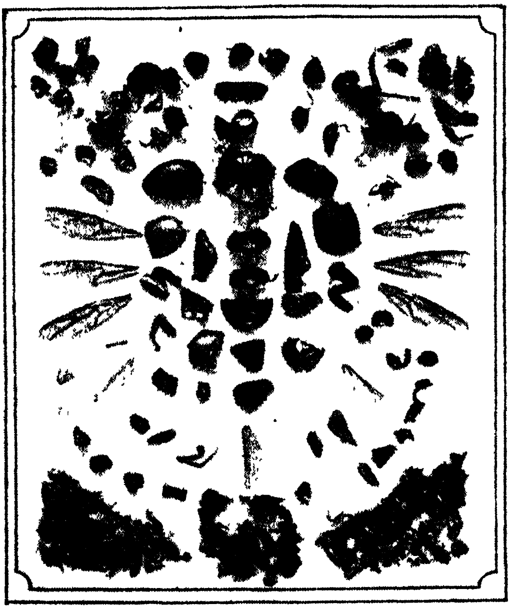


Plate 106.

STOMACH CONTENTS OF KOOKABURRA.—Cicadas, ants, spiders, and beetles.

Feeding Habits of Introduced Birds.

The **sparrow** has spread widely throughout Australia since it was first introduced to this continent. It increases rapidly, perhaps because its food requirements are met by a wide range of insects, seeds, domestic scraps, and fruit. White ants, cabbage moths, blow-flies, and aphids are among the principal insects caught by it, but, to counter its usefulness in this way, are the damage done when flocks feed on germinating grain crops and its well-known habit of snipping off the tops of young vegetables. Nests in the eaves of buildings are also a nuisance, not only through blockages caused to spouting, but also because innumerable bird mites frequently invade dwellings when the nests are vacated.

The **starling**, another introduced bird, feeds on a wide variety of insects, including ants, grasshoppers, and cutworms. Ticks are also relished, and a flock may settle on resting cattle to feed on these pests. Nevertheless, the starling must be considered injurious for it does a great deal of damage to grain and fruit crops, particularly during a dry season when alternative food supplies are scarce. Like

the sparrow, the starling is very aggressive and tends to oust useful native birds from areas where their presence is very desirable.

A third introduced bird, the **Indian mynah,** is related to the starling and at one time held promise of being a useful predator on ticks. Unfortunately, it seldom flies far from residential areas and has therefore made little, if any, contribution to the solution of the tick problem.

Effect of Bird Life on Insect Pest Outbreaks.

From the foregoing outline of the feeding habits of the better known birds, there can be little doubt that insects are the staple food of most of them, and it is therefore necessary to determine what contribution they make to the prevention of pest outbreaks. Insect outbreaks are determined by a number of factors, the balance between which decides whether or no they will occur. These factors include weather conditions which may be favourable or unfavourable for the insect, the amount and suitability of the available food supply which set limits to the numerical increase which may be possible, and parasites which, with the aid of predators, destroy the pest with varying degrees of efficiency. Birds are important predators on insect pests and unlike most of the insects on which they feed they have a relatively slow rate of breeding. Hence, unless they move into an area in large numbers during the early stages of an outbreak of an insect pest, they can do little to stop an attack on crops and pastures. They may, however, slow down the rate at which the insect population increases and, with the assistance of parasites and other predators, shorten the duration of an outbreak. It would appear, therefore, that the most useful birds are those which forage for food over fairly large tracts of country and they will be most effective when the outbreak is merely local in its incidence. Some pests, e.g., grasshoppers, congregate in swarms before they become important, and it is probable that by attacking such aggregates of insects, birds do lessen the chances of a major outbreak. Proof is, however, difficult to obtain.

While admitting the value of most birds in controlling insect pest populations, it may be argued that the damage caused to crops by some, the nuisance value of a few, together with the fact that even purely insectivorous birds seldom discriminate between beneficial and injurious insects, offset any material gain to the farmer. The number of birds with disreputable habits is, however, such a small proportion of the whole bird fauna that indifference to the preservation to bird life is quite unjustifiable. Birds have in no case prejudiced the establishment of an industry or have ever been responsible for more than negligible losses to the farming community as a whole. Hence, the rural balance-sheet must show a considerable credit on the side of birds though its amount will always be a debatable subject. The mere existence of such a credit necessitates a discussion of the methods by which the æsthetic charm and considerable utility of bird life can be preserved and, if possible, made available to the community.

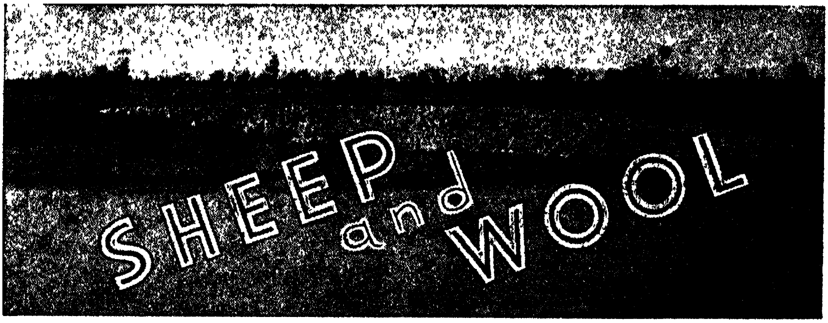
Protection of Bird Life.

Most progressive communities have prepared and put into effect legislation which aims at the protection of at least the more useful birds. All such legislation is based on some kind of classification, determined after reviewing the feeding and other habits of the almost innumerable species with which it deals. Some are protected because of their rarity,

and others because they are useful or harmless. A few receive no protection because they are a menace to the farmer. The destruction of some birds is a criminal offence at any time of the year; others cannot be destroyed during the main breeding season.

The protection of certain birds by simply prohibiting their destruction altogether or during specified seasons does not, however, go far enough. Rural development, particularly in coastal areas, often proceeds with little or no appreciation of its effect on bird life, and some more or less unique and typically Australian birds are now so rare that few people have ever seen them. This is largely due to the destruction of their timbered haunts following the impact of settlement. Recent legislation has taken cognisance of this fact and sanctuaries have been created where birds and other forms of wild life can live unmolested in their natural surroundings. These sanctuaries serve a double purpose; they give wild life the opportunity to survive and also enable the community to see the country in its original form.

In Queensland, such legislation as "*The Fauna Protection Act of 1937*," aims, among other things, at the preservation of the more useful birds and has, consequently, a considerable bearing on both the numbers and species found on the farm. Farmers have therefore a duty to both themselves and the community to see that the intent of the legislation is not nullified by vandalism, no matter whether it is due to ignorance of the law or malicious habits in the individual.



Grazing Selection Improvements.

J. L. HODGE, Instructor in Sheep and Wool.

PROPER expenditure on necessary improvements on the grazing selection is most important. Under our land laws the selector is responsible for an amount, assessed by the Land Court, for existing improvements. It will therefore be readily understood that necessary improvements on some areas will be greater than on other areas of the same extent, this difference being dependent on existing improvements. For the purpose of this article, it is proposed to take an area of land quite bare, so that all necessary improvements may be touched on. Where capital is available it is an easy matter for the selector to inadvertently over-capitalise a grazing area. Therefore it should be of first importance to estimate the cost of all improvements with the idea of comparing the result, plus the value of the land, with the known value of surrounding properties. The value of an improved selection is judged by what it will reasonably produce annually, capitalised.

Water.

No land can be occupied without a water-supply. If there is a natural supply, so much the better. If not, provision has to be made. This may entail extension of existing bore drains, the sinking of a well or a sub-bore, or the provision of earth tanks. The choice of these should be entirely governed by existing conditions, and the success or otherwise of water projects in the surrounding country. If it is possible to arrange for the extension of existing bore water supplies that should be done. If water is to be got at reasonable depth and at a reasonable price by sinking a sub-bore, it also should be done. In country where underground supplies have proved too deep and costly, or salty when tapped, recourse may be had to surface water conserved in earth tanks. In this connection, the point is stressed that small tanks are a waste of money. It has been frequently observed on a selection that although ample money had been spent on surface water in the first dry spell the land is waterless. This is the result of sinking several "pot holes" excavating small tanks instead of spending the money available on one assured supply.

On a small selection, such as is now under discussion, a main water supply, centrally situated, ensures that sheep do not have too far to walk. Therefore, it is wiser to provide for a water supply and then

consider sub-divisions, and not, as is frequently done, fence the country into paddocks and then put an inadequate "pot hole" in each.

The Homestead.

The homestead should be as good as is consistent with the capital value of the property. Circumstances alter cases in this matter of a suitable dwelling, particularly if the family is large. The ground plan of a house, not too costly, is illustrated.

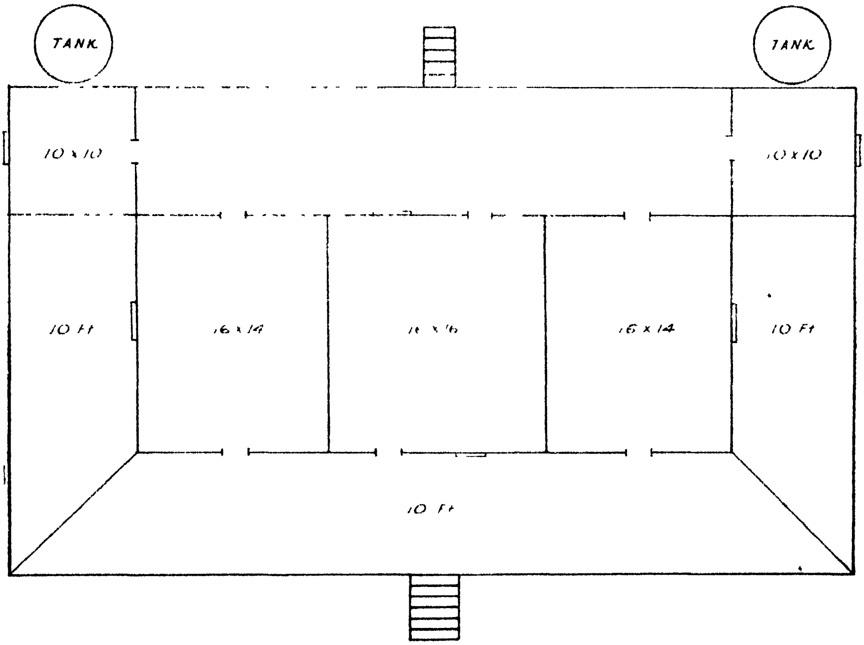


Plate 107.

GROUND PLAN FOR A GRAZING SELECTION HOMESTEAD.

The Horse Paddock.

Before erecting any line of fence a horse paddock should be provided. On new country too much time is lost hunting horses and house cows. Consideration of the site is important. Some think a corner of the property saves two sides of fencing. On the other hand, a horse paddock centrally situated saves miles of horse work in a year, and the subdivision fences attached to the horse paddock save just as much fencing as the paddock in a corner. The horse paddock should be large enough to run all the working horses and house cows comfortably, and perhaps a few rams or ration sheep.

A six-wire fence is recommended. A five-wire fence is ample to hold horses and cattle, but while on the job it is just as well to be sure of rams and killers.

Yards.

Good, substantial yards should be built on a convenient site to serve the double purpose of accommodating the milkers as well as the horses. If the two bottom rails are kept low enough, rams and killing

sheep may also be yarded without risk of their getting through. As to gates, let it be urged that all gates on the property be properly constructed and swung. Make-shifts never pay, and, in many cases, when commenced with, remain for years to the discomfort and irritation of all concerned, to say nothing of daily loss of time in opening and shutting them.

The Boundary Fence.

It is assumed that it is necessary to rabbit- and dog-net the boundary fence. In normal times, generous provision is made by the Department of Public Lands in respect of the procuring of dog and rabbit netting. Fencing timber should be considered and the choice, if there is a choice, should be made of that timber most useful for its longevity in the surrounding district. Split pine, split ironbark, or round sandalwood are all good fencing materials. With sandalwood, the post should not be less than 4 inches at the small end. It is considered a comparative waste of money to erect a dog- and rabbit-proof fence less than 6 feet high. If funds permit, it is advisable to run a top barbed wire.

Strainer posts should be at least 2 feet 6 inches in the ground and well strutted. Strains may be 6 chains with fencing posts 12 feet apart. Every fourth post should be a high post for the purpose of carrying the top netting. All posts should be sunk to a depth of 20 inches. The rabbit netting should be trenched and buried to a depth of 6 inches and well rammed. The most satisfactory wire for the top netting is 12½-gauge steel wire. It is a good plan when using this wire to attach a couple of feet of thicker, softer wire at strainer posts. This permits frequent breaking when the 12½-gauge steel wire is in use. The netting should be made as rigid as possible. Four plain wires are necessary in a fence of this description—the first wire 6 inches above the ground, the second in the middle of the rabbit netting, the third 3 feet from the ground (at the top of the rabbit netting), and the fourth wire 6 feet from the ground and carrying the top or dog netting. Care should be taken when crossing watercourses with a netting fence. Flood gates may be constructed, or a flap of netting attached, well sunken in the ground, and so hooked that flood waters will force this flap down and pass over without greatly damaging the fence. Generally, the greater number of subdivision fences of sheep paddocks the better. However, the economic division of the area will be greatly influenced by the water supply. In every paddock access to water should be provided and the fence lines should be as short as practicable accordingly. Again, a six-wire fence is advised, and the fencing timber may be similar to that of the boundary netting fence. Thought should be given to the placing of gates in subdivision fences with the object of obviating the driving of stock distances greater than necessary.

Ringbarking.

Ringbarking is necessary in timbered areas to bring the country to a payable carrying capacity. The country to be ringbarked should be chosen intelligently. Too often country is unwisely rung in a face. Apart from commercially valuable timber, all good shade trees should be left. Windbreaks across a paddock at regular intervals are valuable for shade and shelter. Timber fringing waterways for some distance on both sides should not be rung.

There are two regular methods of ringbarking—collar-ringing and frilling. Collar-ringing, usually applied to big timber, consists of a double cut entirely releasing a strip of bark from the tree. Frilling, which is usually applied to smaller trees, is done by a cut through the bark and into the sapwood with a pressure of the axe outwards for the purpose of leaving the "frill." With frilling, great care should be taken to see that the cuts overlap so that the severance of the bark is complete. The cost of ringbarking depends entirely on the class of country and may range from 1s. an acre to 6s. an acre, according to the density of the forest in the area chosen.

Drafting Yards.

Sheep-drafting yards are one of the most important of improvements. Therefore, it is well to make a good job as soon as practicable. On a small selection it is an advantage to have the drafting yards erected in connection with the shearing shed. If that is done, provision should be made for a ramp from the yards for the purpose of filling the shed.

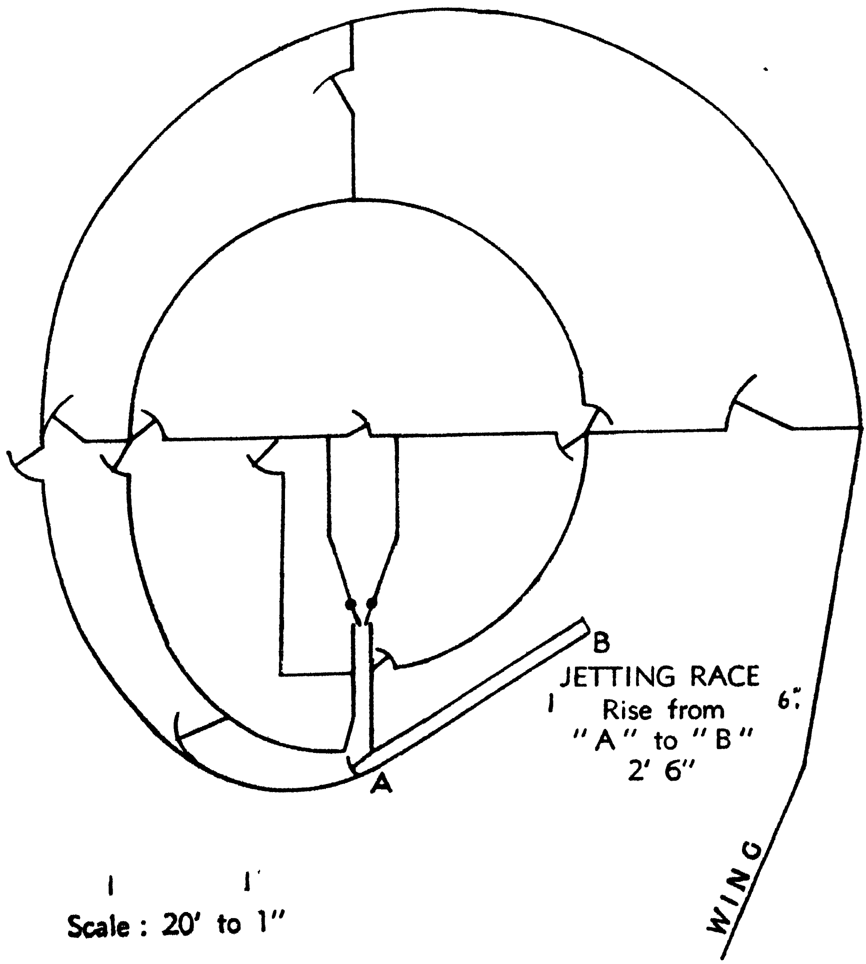


Plate 108.

The "bugle" plan for a set of yards, as illustrated, will be found to have many advantages. Where the timber is available, these yards are comparatively cheap to construct and are adapted especially to the handy working of sheep in times when labour is scarce.

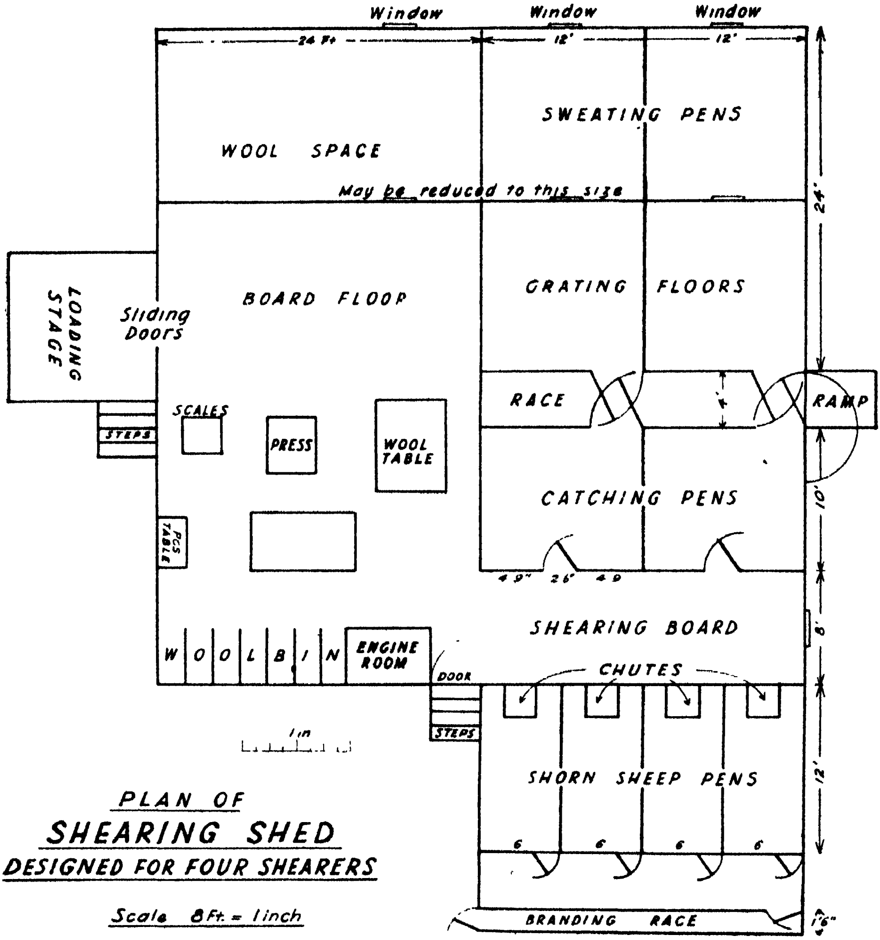
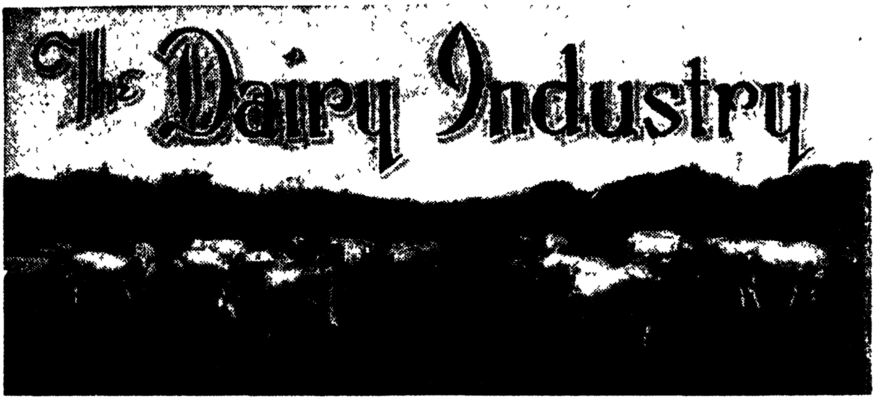


Plate 109.

The Shearing Shed.

In size and accommodation for men and sheep the shed should be based on the carrying capacity of the property. When it is considered that, in all probability, a shed is used only once a year it is a capital cost and care should be taken in estimating the cost. Whatever the size required, the shed should be solidly constructed and every gadget thought of to facilitate shearing operations. The plan illustrated is of a four-stand shed. It will be observed that the shed may be made larger or smaller without greatly interfering with the general plan. In a shed of this kind the average weekly cut, given fine weather, should be about 2,000 sheep.



Queensland Cheese Production.

E. B. RICE, Director of Dairying.

QUEENSLAND cheese production of 12,724 tons for the year 1942-1943 constituted a State record, and far exceeded the previous year's production of 7,299 tons which was then a record. Incidentally, Queensland was the largest cheese producer of the States in the year under review, a position not held since 1934-35, and the gross value of output exceeded £1,000,000 for the first time in the State's history. The effect of the diversion to cheese production, commenced in 1940-41, and of the legislative enactment of 1941 compelling suppliers in gazetted milk areas surrounding cheese factories to supply such factories was only fully apparent in the year just concluded. The stepping up of production in a period of two years to almost treble the pre-war level is an accomplishment of which the industry can justifiably feel proud. While hostilities continue and for some few years thereafter there appears to be a ready market for all the cheese which Queensland can produce.

Despite the huge increase in production in recent years quality has been well maintained. 22,344,785 lb. or 80·58 per cent. of the year's total output, was officially graded. The comparative gradings for 1942-43 and 1941-42 were:—

Grade.	1942-43. Per cent.	1941-42. Per cent.
Choice and first	73.17	72.83
Second	26.32	25.63
Third	.51	1.54

The marked improvement in cheese quality in the past few years may be regarded as a most satisfactory sequel to the campaign for the rehabilitation of the cheese industry, initiated in 1938 and since then actively pursued by the co-operation of the industry and the Department. Special praise is due to the new factories erected in response to the cheese expansion drive for the consistently satisfactory quality of their produce. The results undoubtedly justify the Departmental policy of insisting upon substantial and well-equipped factories and not permitting manufacture in temporary structures without adequate equipment.

SUMMARY OF OPERATIONS OF QUEENSLAND CHEESE FACTORIES, 1942-43.

Factory.	Milk Received.	Cheese, Green Weight.	Butterfat.	Cheese Yields.		Average Test.	Gradings of Cheese.				
				Per 100 Lb. Milk.	Per Lb. Butterfat.		Total Submitted.	Choice.	First.	Second.	Third.
	Lb.	Lb.	Lb.	Per Cent.	Per Cent.	Per Cent.	Lb.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Aubigny	2,624,320	273,917	97,228	10·43	2·81	3·704	281,701	..	91·3	8·7	..
Biddeston	8,536,284	922,045	321,230	10·801	2·87	3·76	823,408	3·0	96·4	0·6	..
Chinchilla	5,066,317	512,073	190,870	10·107	2·68	3·76	515,132	1·8	88·8	9·1	0·3
Coalstoun Lakes	2,316,179	241,216	89,293	10·41	2·701	3·85	111,634	..	1·8	92·2	6·0
Daredale	3,308,936	323,846	122,569	9·78	2·64	3·704	327,877	..	75·0	25·0	..
Downs, Boodua	3,077,530	330,792	125,020	10·74	2·64	4·06	234,558	..	68·2	30·2	1·6
Downs, Toowoomba	6,743,022	678,696	264,049	10·06	2·57	3·91	403,730	..	70·9	27·3	1·8
Dundarrah	1,710,726	167,868	63,801	9·81	2·63	3·72	25,241	..	..	100·0	..
Felton	7,094,204	774,409	279,494	10·91	2·77	3·93	534,117	..	41·3	57·7	1·0
Greenmount	3,638,603	395,219	138,472	10·86	2·85	3·8	293,070	..	45·2	54·8	..
Highgrove	2,660,876	279,267	106,177	10·49	2·63	3·99	238,638	..	7·3	84·4	8·3
Hoopert, Closed April, 1943..	2,399,763	263,160	95,272	10·96	2·76	3·97	277,839	..	81·9	18·1	..
Irongate	5,391,045	580,856	199,198	10·77	2·91	3·69	572,260	1·2	92·1	6·7	..
Kooroongarra	6,703,312	685,882	247,031	10·23	2·77	3·68	713,511	4·0	91·4	4·6	..
Lilyvale	3,433,911	365,585	132,458	10·64	2·76	3·85	365,977	..	81·6	18·4	..
Mailing	5,970,007	597,617	225,322	10·02	2·65	3·77	116,954		5·5	94·5	..
Maclagan, Maclagan	9,948,977	1,031,900	371,289	10·37	2·77	3·73	1,036,704	.	30·3	68·2	1·5
Maclagan, Kulpi	8,835,222	900,280	330,658	10·18	2·72	3·74	876,893	..	78·2	21·7	0·1
Maryborough, Kingaroy ..	5,808,102	551,959	222,496	9·5	2·48	3·83	162,942	..	85·5	14·5	..
Tansey	2,888,072	283,535	116,562	9·85	2·43	4·0	201,093	0·8	98·8	0·4	..
Wondai	5,077,371	514,634	195,223	10·13	2·63	3·84	134,405	..	91·1	8·9	..
Maxam	7,384,598	766,204	289,986	10·37	2·64	3·92	729,500	..	50·0	48·3	1·7
Moola	8,662,808	878,803	329,529	10·14	2·66	3·8	814,309	0·1	76·8	22·6	0·5
Mount Sibley	3,956,013	421,411	155,057	10·65	2·71	3·91	542,543	..	40·2	56·4	3·4
Mount Tyson	9,649,578	1,031,274	361,908	10·68	2·84	3·75	823,662	6·3	90·9	2·8	..
Nanango	4,426,509	434,671	161,298	9·81	2·69	3·64	370,021	..	90·4	9·6	..
Oakey	4,281,062	445,560	166,026	10·4	2·68	3·87	438,552	1·4	91·2	7·4	..
Pauls	228,590	23,816	8,431	10·41	2·82	3·68	10,335	..	95·4	4·6	..
Pittsworth, Pittsworth ..	12,602,310	1,311,725	482,314	10·4	2·71	3·82	1,098,023	23·2	75·2	1·3	0·3
Brookstead	3,327,587	347,774	126,607	10·45	2·74	3·8	331,422	0·1	70·4	29·5	..
Linthorpe	4,513,008	468,603	161,477	10·38	2·9	3·57	441,554	..	80·7	19·3	..
Scrubby Mount	2,467,507	256,172	93,051	10·38	2·75	3·77	213,609	..	15·4	81·9	2·7
Springside	4,573,157	484,707	167,963	10·59	2·88	3·67	410,014	15·1	78·6	5·8	0·5
Yarranlea	7,105,562	738,934	268,116	10·39	2·75	3·77	643,213	2·5	88·4	8·8	0·3
Port Curtis, Bracewell ..	6,821,717	674,447	283,510	9·83	2·37	4·15	293,555	..	75·2	22·6	2·2
Theodore	3,178,309	316,035	126,850	9·9	2·49	3·97	67,002	..	71·5	28·5	..
Quinalow	8,822,412	908,533	324,848	10·29	2·79	3·68	934,694	..	85·5	14·5	..
Ramsay	3,707,249	370,610	144,756	9·99	2·56	3·9	337,258	..	46·6	53·0	0·4
Rockview	2,779,344	294,202	108,059	10·58	2·72	3·88	305,713	..	66·9	33·1	..
Rocky Creek	5,477,505	570,664	200,071	10·41	2·85	3·65	571,685	..	58·7	40·8	0·5

Rosemount	5,291,356	529,986	203,310	10 01	2·6	3·84	481,262	..	17·4	80·6	2·0
Southbrook	8,212,581	865,401	307,763	10·53	2 81	3·74	798,032	0·05	89·3	10·4	0·25
South Burnett, Goomeri ..	5,013,502	525,921	201,490	10·49	2·61	4·0	482,074	..	87·5	12·3	0·2
Sugarloaf	2,636,194	269,770	108,675	10 23	2·48	4·12	223,586	..	53·1	46·9	..
Sunnyvale	2,159,171	229,200	86,891	10·61	2 63	4·02	177,114	..	9·4	90·6	..
Warwick, Greymare	3,076,473	313,461	118,974	10·18	2 63	3·86	168,128	..	59·6	40·4	..
Warwick, Lord John Swamp	1,424,277	146,996	56,480	10·32	2 6	3 96	76,879	..	10·6	81·4	8·0
Warwick, Talgai	2,110,835	220,693	81,535	10·45	2·7	3·86	136,831	..	16·3	82·3	1·4
Warwick, Victoria Hill ..	1,525,720	162,656	56,062	10·66	2·9	3 67	90,077	..	8·0	88·9	3·1
Warwick, Mill Hill	15,616,351	1,630,420	606,865	10·44	2·68	3·88	660,753	8·0	86·3	5·7	..
Woodleigh	3,609,581	373,205	136,766	10·33	2·72	3·78	381,911	..	72·8	27·2	..
Yamsion	4,456,987	480,915	171,414	10·79	2 8	3·84	493,241	..	77 3	22·3	0·4
Yargullen	5,381,503	562,553	210,023	10·45	2 67	3·9	550,549	1·3	91·4	7·1	0·2
Totals	267,712,135	27,730,083	10,239,817	10·35	2 78	3·82	22,344,785	2·35	70·82	26·32	0·51

The encouraging response to the pasteurisation of milk for cheese manufacture has no doubt contributed in no small measure to the improvement in quality. Only seven of the fifty-eight factories are now not equipped for pasteurisation, and, as these factories are all small units, Queensland cheese is now mainly manufactured from pasteurised milk.

The average test of milk received was 3·82 and the range of tests was from 3·57 to 4·15. These tests reflect the suitability, from the compositional viewpoint, of milk supplies in the cheese-producing areas of this State. This is also borne out by the State's mean yield of 10.35 lb. of cheese per gallon of milk and 2.78 lb. of cheese per lb. butterfat.

The average price (including Commonwealth Government subsidy) received by suppliers was 1s. 10·06d. per lb. butterfat as against 1s. 6·58d. in 1941-42.

The use of artificially cooled holding rooms at fifteen factories, in comparison with such an installation at only one factory in 1938-39, is a pleasing feature of the progress of the industry. Its further extension to all large factories when the necessary machinery is again available should be encouraged as the final phase of the factory rehabilitation programme.

Although much satisfaction can be felt at the progressive improvement in cheese quality since the campaign was initiated in 1938, there is still ample room for improvement, and it is hoped this will be heeded by those few factories which have not given their due measure of response. Inferior cheese will not be sought after by consumers in the post-war period and factories continuing to manufacture same are likely to be forced out of production.

The attached table, prepared by Miss P. Horsley, of the Dairy Branch, and summarising operations of each factory for the year 1942-43, will prove of interest to manufacturers and producers.

SUGAR CANE AND ITS CULTURE.

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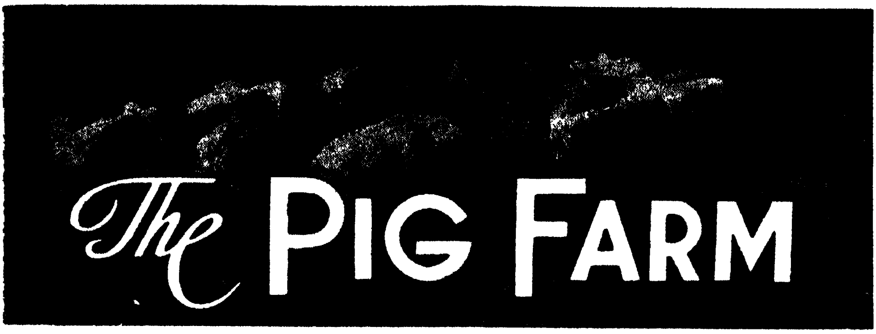
Will readers please note that VOLUME IV.—SUGAR CANE AND ITS CULTURE—of the **Queensland Agricultural and Pastoral Handbook** Series, is now out of print and, in consequence, further orders cannot be fulfilled.



Unprofitable Sows.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

PROFIT in the pig industry is largely determined by the number and size of the litters produced by sows during their lifetime. Research in England showed that, on the average, approximately one-third of piglets born alive died before reaching six months of age. In one investigation, average litter size at weaning age ranged from 5·6 pigs weaned in the herd with the lowest average to 10.5 pigs weaned in the herd with the highest. This question of sucker mortality in pig production and why some sows become unprofitable is of considerable consequence to the industry in this State, and the importance of obtaining and retaining only those sows which will produce and rear large, thrifty litters can hardly be over-estimated.

Big letters are more profitable than small litters and sows which consistently rear fifteen pigs annually pay better than those which produce only ten pigs in the same period, for maintenance cost of the sow is very much the same, irrespective of the number of pigs she rears to marketable age. The small litter at weaning and at market age is not generally due to infertile sows but rather to loss by death during suckling and final preparation for market, and as much of this loss can be avoided by careful management it is important to ascertain the nature of the causes of mortality and to consider methods for their elimination or control.

Mortality Analysed.

In England during one series of investigations 13,860 living pigs were farrowed from 1,475 litters—an average of 9·4 pigs per litter. Of these 11,340 or an average of 7·7 pigs per litter were weaned; the remainder, representing 18·1 per cent. of the total, died or were killed during the suckling period. Complete records of death covering 1,483 observations were obtained in twenty herds and these are analyzed in the following table:—

ANALYSES OF PRE-WEANING MORTALITY.

Cause of death.	Per cent.
Overlaid by sow	48.7
Bad doers	22.1
Scour or diarrhoea	9.1
Insufficient milk from sow	8.0
Pneumonia and colds	5.2
Savaged by sow (cannibalism)	1.9
Accident	1.3
Miscellaneous causes	3.7

It will be seen that by far the most frequent cause of loss was reported as "overlaid by sow" and occurred in about 49 per cent. of the total litters.

As few sows can comfortably suckle more than ten or twelve pigs, some pre-weaning loss is, of course, inevitable in very large litters. For example, when 1,750 litters were arranged according to the number of pigs born it appeared that 16 per cent. of the litters contained more than twelve pigs at birth; an increase in the number of pigs surviving at six weeks occurred up to litters of twelve pigs, but where there were more than twelve pigs in the litter at birth the increase in pigs born was discounted by a higher death rate; while in litters of fifteen or over between 40 and 50 per cent. of the pigs died before they were six weeks old. This experience has been borne out in observation in Queensland where almost always more than 50 per cent. of the pigs in very large litters die within a few days of birth—that is, in litters of fifteen or more. Overlaying is usually the cause of death in such cases. While a larger litter is, in itself, a predisposing condition to high pre-weaning mortality there are equally important causes, many of which could be removed by better management, such as transferring some of the litter to other sows with small litters and hand feeding those that are sufficiently strong.

In the rearing of piglets whose mother's supply of milk was insufficient excellent results were obtained by removing the piglets immediately and feeding them on cow's milk enriched with cream so that the fat content was from 8 to 10 per cent. The amount of milk fed should be 2 ounces per pig every two hours for the first few days; later ordinary cow's milk can be given, and subsequently skimmed milk. Rolled or hulled oats can be given at ten days of age with good results.

Remedial Measures.

Overlaying may be due to clumsy, overfat, restless, nervous, or ill-tempered sows, and any system which fosters these conditions should be avoided. Clumsiness often results from over-feeding, while restlessness may equally well be caused by under-feeding. Moreover, an irritable pigman often induces nervousness and sudden movement which leads to loss in naturally docile sows. This suggests that experience in handling of live stock is certainly an essential to success. Even temperament and contentment is, without doubt, inherited, and it should be possible to obtain good tempered sows by selective breeding. Young pigs may also be killed by failure to give the sow time to accustom herself to the farrowing pen, by the absence of farrowing rails or a farrowing race, and by the use of too long or too much straw or husk bedding in the pen.

Careful observation in England shows that, assuming two litters are reared by each sow annually, roughly 10 per cent. more pigs would be produced in the summer than in the winter months. No figures are available in Queensland to show averages here, but as our winters are invariably very mild and as stock can be maintained under the open-air system the year round there should be no material difference, from a climatic point of view, between summer and winter born litters.

Death from scour and similar digestive troubles can definitely be controlled by more care, a better knowledge of management, and by removal of the cause when once that is known.

It has been suggested that unthrifty pigs should be removed from litters on the basis that they are carriers of infection, unable to with-

stand infection, and are liable to infect others. Sows and boars with skin eruptions, which, although it cannot definitely be said that these are hereditary, certainly indicate weakened constitution and should be eliminated; only uniform litters should be kept.

Post-Weaning Mortality.

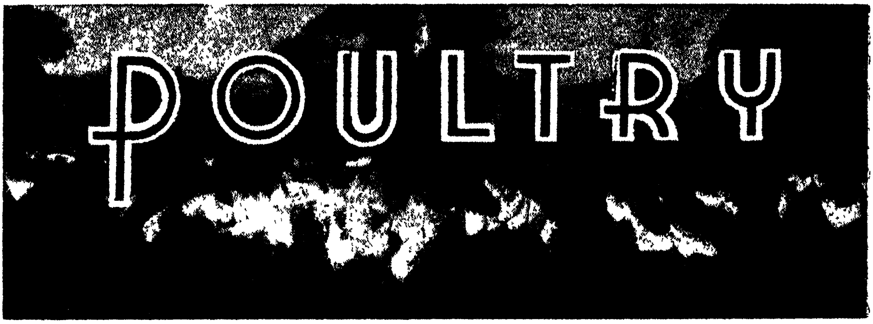
A great many of the deaths between weaning and marketing age can be controlled seeing that in this group deaths due to disease often exceed those due to feeding problems. Fortunately, most of the diseases to which pigs are liable can be warded off if the animals are maintained under sound hygienic conditions and are fed on sound foods. Accidental deaths are small compared with others, and even these, which include deaths in railway waggons en route to factory or in yards while awaiting despatch, comprise but a low percentage of the total number of post-weaning losses.

Better Stock and Better Methods.

It is probable that here, as in England, the average sow is prolific enough though probably more care is exercised there than here, and while the use of reasonably prolific sows is essential to economic pig production the reduction of pre-weaning and post-weaning mortality by the practice of improved methods of management and housing presents a more urgent problem and one that can more readily be attained than by the increase of the litter size at birth. Experience in Queensland suggests, too, that better results are being obtained under the open-air grazing system than under the older and more insanitary method of sty and small bare yard system of housing.

Plate 110.

Small Yards and Over-Feeding.—A group of pigs like this will become excessively fat if confined in a small yard and fed with a superabundance of maize. The system had its place when there was a continuous demand for very fat meat; but changing market demands necessitate alteration in methods. These pigs should be running on a large area of lucerne and pasture land, and be allowed in the maize-feeding yard only an hour or two every day.



Disease Wastage in Poultry Flocks.

L. G. NEWTON, B.V.Sc.

As a consequence of the war, the poultry industry, in common with others, has had to contend with difficulties, such as lack of labour, and increased price and scarcity of poultry foods. To overcome these difficulties, and at the same time face up to the acute shortage of eggs, flock owners are being called on to make every effort to reduce wastage and increase production.

How can egg production be increased? Many suggestions present themselves in answer to this question, but a critical examination of the situation will show that the most immediate and certain means is by the prevention and control of diseases, thereby prolonging the life of the laying hen. After all, irrespective of her potentialities the number of eggs which can be laid is determined by the length of the healthy laying life of the bird.

Disease is a most important source of wastage because not only does it take effect by directly killing off large numbers of birds, but also when death does not occur production may be greatly reduced or may even cease entirely. The latter factor is very often more important than the former, e.g., the mortality in flocks affected with black comb is seldom higher than 2 per cent., whereas production may be depressed for two-three months. In other words, the efficiency of production is greatly lowered.

The question of disease prevention and control is tightly bound up with all phases of management—breeding, feeding, housing, and other activities. Good husbandry will often stave off disease, while bad management predisposes the flock to attack.

In considering the problem on a broad basis, the first essential is to start with healthy breeding stock selected for constitution, stamina, and type. When mating the breeding flocks, therefore, a definite standard should be set, and any bird not measuring up to that standard should be culled.

With the highly intensive methods of poultry raising of the present day demanding huge numbers of chickens over a comparatively short breeding season, it would be tedious to handle each individual bird before including her in the breeding pen. On the other hand, the tendency is to "flockmate" the required number of roosters with a pen of pullets without any semblance of culling at all. This practice of indiscriminate mating cannot be too strongly condemned and is undoubtedly a cause of loss of stamina and increased mortality in poultry flocks over recent years.

The practice of pullet breeding, unheard of in earlier years, is now commonly used to obtain early chickens. It has the grave disadvantage that a bird might be a poor producer or "break down" during its pullet year. Before this is known, many of her eggs will have been hatched and the chickens distributed. By breeding from older proven birds, one at least has the knowledge that they have sufficient stamina to stand up to one year of production without ill effect.

Leucosis.

A further point well worth considering in this respect is that some authorities now believe that leucosis can be controlled to some extent by breeding from older resistant birds. It is suggested, therefore, that commercial hatcherymen should retain for hatching for their own requirements eggs from second and third year or even older birds only. By extending this procedure over a number of years it should be possible to build up a leucosis-resisting flock.

Pullorum Disease.

It should be a regular practice to have the breeding flock blood-tested for pullorum disease each year before mating, taking care to remove all positive and suspicious reactors from the breeding pens. While an annual test carried out in this way cannot be calculated to bring about eradication except perhaps over a number of years, it has undoubtedly been responsible for a great reduction in chicken mortality in their first week of life.

Coccidiosis.

Coccidiosis accounts for more losses, and is more difficult to control than any other specific disease of chickens. The most effective control measures consist of strict attention to sanitation, cleaning up regularly every 24 hours in acute cases. To facilitate cleaning, each unit should be of convenient size, e.g., 100-250 chickens. A light covering of litter on the floors will assist in drying out moisture in the droppings and, at the same time prevent the droppings from sticking to the floor. Although many medicinal treatments have been prescribed, their value is limited and, if used, they should be combined with measures of sanitation. Every effort should be made to anticipate the outbreak and apply immediately the most intensive methods of control. The usual age of infection is from six to eight weeks, but early hatched birds may escape it entirely, while it may occur as early as one week old towards the end of the season.

Wrong Poultry Practice.

With regard to other losses in chickens, it can be surprisingly but truthfully said that more chickens die every year from incorrect management than from specific diseases. Brooding is one of the main factors in determining the ultimate productivity of the full-grown bird, and undoubtedly many birds are prevented from ever reaching their potential production because of setbacks in their early life. As far as practicable, brooding should be under the supervision of one person to obtain uniformity. The comfort of the chickens should be the guiding factor in deciding the correct temperature rather than any arbitrary level. The effects of overheating and lack of ventilation are equally as serious as underheating or chilling.

Fowl Pox and Worms.

From six weeks onwards the two diseases of young stock to be guarded against are fowl pox and worm infestation. The former disease may be considered endemic in the Brisbane metropolitan areas. For this reason, greater use should be made of vaccination in the prevention of the disease. Whilst there is still a great deal to be done in the standardizing of vaccines, reliable ones are available on the market and wider use of them is recommended. It must be stressed, however, that only healthy birds should be vaccinated; vaccinating unthrifty birds or those suffering from any obvious disease is only courting trouble. It is also important to remember that if a portion of the flock is vaccinated, the disease will occur, very often severely, in the remainder of the young birds. It is essential, therefore, that all young birds be done at once.

Worm infestation is most severe among growing stock, about twenty-five adult Ascaradia being pathogenic, while older birds can withstand up to forty. Worm parasites often assume pathogenic importance, particularly where chickens are being reared semi-intensively or on unspelled ground. Treatment in these cases is necessary and should be applied promptly and the birds then moved to fresh quarters. The most satisfactory treatment consists of a flock administration of nicotine sulphate of which a limited quantity is available. The drug is added to a wet mash at the rate of ·5 ccs per 1 lb. of food and fed over a period of four to six days. Drug treatment is of little value, however, unless combined with strict sanitation measures. If the birds are treated and returned to dirty pens they quickly become reinfested.

Disease Control.

Leucosis is now more prevalent in Queensland flocks than any other disease, and because of lack of knowledge of the cause and its mode of action it is difficult to set down definite control methods, but the following recommendations should be helpful:—

(*a*) Breed as far as practicable from two- to three-year and even fourth-year hens in the hope of gradually increasing the resistance of the flock.

(*b*) Handle growing pullets with the utmost care. Sudden changes in feeding or housing, frights or forcing, particularly at the time of commencement of laying, are likely to bring on an attack.

(*c*) Cull birds showing signs of the disease heavily.

Outbreaks of blackcomb are now confined mainly to growing pullets and its worst effect is to retard the onset of laying. There is no specific treatment but dosing with Epsom salts in the early stages tends to bring about quicker recovery.

The relationship of feeding to disease control has been clearly demonstrated over the past year. It seems quite certain that the use of substitute foods, as a result of shortage of wheat products, has been the cause of the appearance of curled toe disease—caused by a deficiency of riboflavine—for the first time in this State. This disease was diagnosed in several flocks, all being fed the same ration, and the affected birds quickly responded to a corrected diet.

Poultrymen who mix their own rations are advised to give careful consideration to the purchasing of apparently cheap foods. Standard

feeding tables should be consulted, and if not familiar with these, poultrymen should obtain expert advice on the comparative food value in terms of protein and carbohydrate content, &c., as well as their relative monetary value. Care should be taken to include the correct proportion of each ingredient, for when a substitute food is added the whole ration may require re-balancing.

Repeated or sudden change of the ingredients is always apt to cause a check in laying, and any change should be introduced gradually.

Although it may seem costly in the initial outlay, it is more economical over a given period to feed the maximum in quantity and quality. It is recognised to-day that a high intake of good quality food will give increased production, growth and resistance to disease.

When computing rations, the protective foods, i.e., the vitamins, should receive due consideration. The two important ones at present are A and riboflavine. There is little excuse for the occurrence of vitamin A deficiency in Queensland flocks as there are so many vitamin A-rich foods available, e.g., yellow maize, green feed, lucerne chaff, and codliver oil (pilchardine). It would be false economy to exclude all sources of this vitamin from the ration, although their initial cost may appear high. Similarly deficiency of riboflavine can be prevented by including bran, livermeal, milk, etc., in the chicken ration.

With the temporary boom in the industry, many poultry farmers may be tempted to rear "a few more chickens," and thus add an extra burden to their already overcrowded accommodation. There are very few commercial farms which are not at present overcrowded to a risky extent. It has been proved that the incidence of disease increases directly in proportion to the increase in overcrowding.

It is preferable to raise chickens intensively on a concrete floor well covered with litter until they are four to six weeks of age, after which they may be given range with "arks" or colony houses. In this way fresh ground for each batch of chickens can be arranged. With the semi-intensive system the runs become heavily charged with parasite eggs, coccidia, etc.

Laying birds when housed intensively should be given ample floor space, as it has been proved that overcrowding gives decreased production and increased mortality. At least 4 square feet should be allowed for each bird with the intensive system.

The regularity of cleaning poultry houses and the choice of litter are points which might well be left to the discretion of the individual poultry farmer. It is pointed out, however, that the litter should be 4-6 inches deep to provide scratching exercise and at the same time dry out moisture from droppings and litter.

Disinfectants are valuable in maintaining proper sanitation, e.g., in incubator and brooder disinfection. Care should be taken in selecting a suitable disinfectant. Points to be taken into consideration are the cost, efficiency in the presence of organic matter such as droppings, ease of application, and the time required to kill germs. Their odour is no guide to their effectiveness, and often those which appear costly initially are most economical.

Summary.

The most obvious means of reducing wastage and increasing egg production by the prevention and control of disease may be summarised as follows:—

(1) **Breed only from birds of a definite standard of stamina, constitution, and health.**

(2) **Blood test each year for pullorum disease.**

(3) **Endeavour to anticipate coccidiosis. Rely mainly upon sanitation for its control.**

(4) **Pay particular attention to brooding.**

(5) **Vaccinate against fowl pox or in areas where the disease occurs every year.**

(6) **As a means of combating leucosis—**
   (a) **Breed from older birds.**
   (b) **Cull heavily.**
   (c) **Manage pullets carefully.**

(7) **Practice regular hygiene to prevent worms reaching harmful numbers.**

(8) **Feed a well balanced ration of good quality food.**

(9) **Avoid overcrowding. Rear growing stock on fresh ground or free range.**

HANDBOOK VOLUMES OUT OF PRINT.

—oOo—

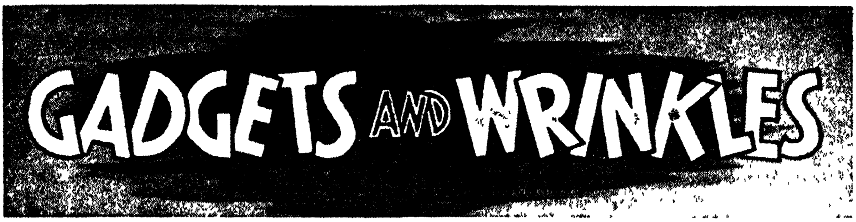
Because of an extraordinary demand for the **Queensland Agricultural and Pastoral Handbook,** stocks of—

VOLUME III.—INSECT PESTS AND PLANT DISEASES, and

VOLUME IV.—SUGAR CANE AND ITS CULTURE

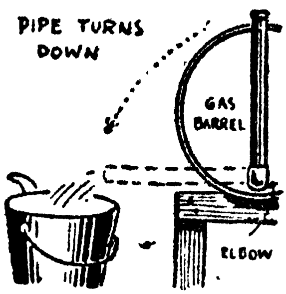
are now exhausted.

Copies of VOLUME I.—FARM CROPS AND PASTURES, and VOLUME II.—HORTICULTURE—are still available at the prices stated in the advertisement on the back cover of the **Journal,** on application to the Under Secretary, Department of Agriculture, Brisbane.



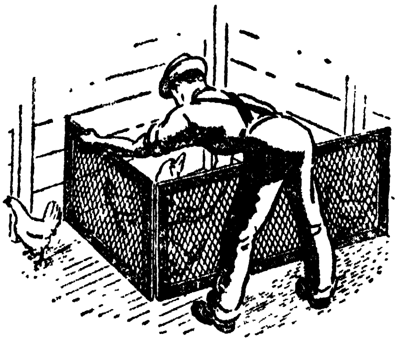
A PETROL DRUM STAND.

This device makes lifting a petrol drum unnecessary. With 4 x 4 material a stand is made to keep the drum eight inches or so off the ground. Into the end of the drum a 2½-inch nipple on a ¾-inch pipe is screwed. To this is connected a ¾-inch elbow and 20 inches of ¾-inch pipe, threaded at both ends. When petrol is wanted the screw cap is removed and the pipe to the left turned down until the petrol runs into the bucket. To shut off, the pipe is lifted to the upright position again and the cap replaced.



NAIL-DRIVING WITHOUT TEARS.

To drive a nail in an awkward spot without the risk of damage to your thumb, first thrust the nail through a piece of stiff paper and hold this instead of the nail.



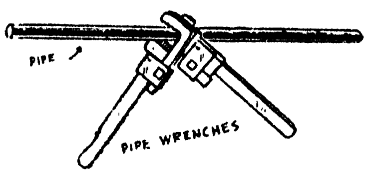
CATCHING CHICKENS.

A hinged panel covered with wire netting makes it a simple matter to catch chickens in the house or in the corner of a pen. A long panel (5 to 7 feet) and a short one (2½ to 3 feet), both the same height (30 to 36 inches), hinged together is used as shown. Panel frames are 1 x 4 timber covered with 1-inch wire netting.

With a light weight portable panel like this, chickens of any age can be easily and quickly held in the corner of the pen for culling or for testing or for any other purpose.

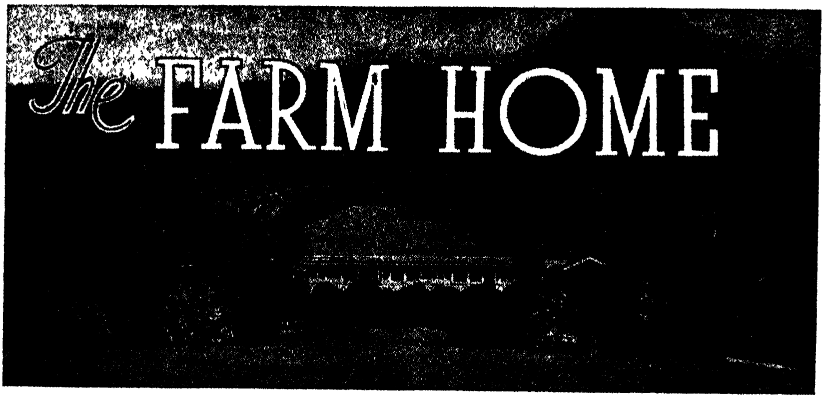
IMPROVISED PIPE VICE.

The accompanying sketch shows how to assemble a handy emergency pipe vice by using a couple of pipe wrenches. Set the wrenches with the jaws facing in opposite directions and the handles spread at an angle. Put the pipe in the wrenches as shown and with the left hand hold it firmly against the ground while it is being cut.



TIGHTENING LOOSE THREADS.

One layer of fine brass gauze wrapped round the thread will usually do the trick. This has been found to be particularly effective on worn gland nuts from pumps and stuffing boxes.



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

SAVE THE BABIES.

THE hot season is coming. Probably more babies will become ill during the next three months than during any three months in the year. It is—though it should not be—a dangerous season for babies. They may become ill from an infectious but preventable disease.

Summer diarrhoea, dysentry, gastro-enteritis, by whatever name it may be called, is an infectious disease. It is caused by germs which are carried about by flies. What can mothers do to save their babies from it?

Natural Feeding.

The first way to save the babies is by giving them their natural food; the food which is perfectly clean, fresh, and safe. Never wean the baby during the next three months if it can possibly be avoided. If it is necessary to wean him, or if he has been weaned already, the problem is a much greater one.

Care of Milk and Other Baby Foods.

Most women who have to keep house in a sub-tropical climate hope that post-war housing plans will ensure that domestic refrigeration will be available to all. In the meantime, the baby's milk will probably have to be kept fresh without it—often without ice also.

The germs of dysentry are never present in freshly boiled, scalded, or pasteurised milk, for boiling or pasteurising kills them. So the first thing to do is to make up the baby's milk mixture as soon as the milk is delivered, following carefully the written directions which the doctor or the sister at the Welfare Centre has given. Then cool the milk quickly by placing the jug—well covered with two thicknesses of mosquito net or coarse muslin—in running water or frequently changed cold water. This quick cooling is most important. As soon as the milk is cool, it should be placed in the ice chest, or failing that, stood in a pie dish filled with cold water, allowing the muslin covering to dip into the water all round. The dish should not be stood in the kitchen or in a closed cupboard, but in a safe in a draughty place in the open air on the shady side of the house. Milk and other foods should be kept away from dust and as far as possible from drain openings, rubbish heaps, or garbage of any kind. The Welfare Centres have a good pattern for a cooler which can be made from rustless iron or kerosene tin, but materials to make it may present a difficulty at the present time.

Pasteurised milk delivered in sealed bottles should never be placed in water, which in summer may be warmer than the milk and so cause it to go bad. The bottles should be placed in an ordinary wooden candle box and surrounded with clean chaff or sawdust, and kept in an outside safe or other cool, airy place. By this means bottled milk delivered cool at the house may be kept cool and safe for a whole day even in hot weather. Pasteurised milk, not sold in bottles, should be treated as warm milk and scalded.

If in the country and there is nothing but tank or bore water to depend on, it should be remembered when the weather is hot to keep a bucketful of water in the open air all night and, in the morning, shaded from the rising sun. In this way, the baby's milk may be successfully cooled.

Dried milks, sugar, and all utensils used in the making of baby's foods should be well covered from flies. It is a good plan to have a small table kept specially for the baby's things and covered with a voile or muslin cover weighted at the corners. Bottles and teats should be very carefully treated—the Welfare Centre sister will show you how to clean them and keep them so that they will not constitute a dangér to the baby.

Burn the dummy—nothing that can be done will make it safe. It should be remembered that one fly on the dummy or on a baby's food may spell death or a severe and weakening illness for the baby. It is not said that every mother who does her very best will never have a sick baby, but it is asserted that such babies will not become ill so easily and they will recover much more quickly. The health and the lives of our Queensland babies are in the hands of Queenslanl mothers. This summer everything should be done to save the babies, who are so valuable to the country, especially at the present time.

Questions on this and any other subject concerning maternal and child welfare will be answered by communicating personally with Maternal and Child Welfare Information Bureau, 184 St. Paul's terrace, Brisbane, or by addressing letters "Baby Clinic, Brisbane." These letters need not be stamped.

IN THE FARM KITCHEN.

The Makings of a Square Meal.

Vegetable and Bone Soup.—Take a pound of shin of veal or mutton, or bones of some young animal—lamb, chicken, kid, rabbit, &c.; chop up so as to expose marrow; place in a saucepan and cover with one and a-half pints of cold water, and half to one tablespoon of malt vinegar, but no salt. Simmer gently for some hours, the longer the better, add a handful of mixed vegetables and simmer again for one hour; strain and make up to one pint, and allow to set into jelly. Practically any vegetables may be used, according to the season, and should include, from time to time, cabbage, spinach, lettuce leaves, turnip tops, beans or bean strings, carrots, parsnips, turnips, onions, cauliflower, fresh or dried peas, celery, potato, pumpkins, &c. From time to time add other odds and ends, such as a piece of liver or brains, or a teaspoon of marmite, sweetbread, and so on. By varying the constituents of the soup, a variety of necessary elements is ensured in the child's food. Do not skim all the fat off the soup as it is mostly marrow fat and very nutritious. This soup can be used on two consecutive days if it is brought to a boil at night and kept in a cool place.

American Soup.—Take 1 lb. neck mutton, ¾ lb. peas (fresh, dried, or split), ¾ lb. tomatoes (fresh or tinned), 1 onion, 1 carrot, 1 turnip, saltspoonful of sugar, a little celery, pepper, salt, 2½ quarts water.

Soak the peas and put them in a pan with the mutton and water. Boil up, then add onion, carrot, turnip, and celery, cut into small pieces, and the sugar. Boil slowly for two hours, then add the tomatoes, also cut up small, and boil for half an hour longer. Take out the meat and put the soup through a fine sieve. Return it to the saucepan, add the pepper and salt, and serve with small squares of fried or toasted bread.

Brown Stew of Tripe.—1 lb. tripe, 4 onions, 1 oz. butter or good dripping, 1 tablespoon flour, ½ pint water or stock, salt and pepper. Soak tripe and scrape it, put into cold water in saucepan and bring to the boiling point; drain tripe and cut into neat squares. Prepare onions, cutting them into slices. Melt butter in a saucepan, add onions, and fry a golden brown; add flour, brown lightly, add water or stock, stir till boiling, season; add tripe, and allow to simmer gently for two hours.

Minced Tripe for Children.—Cleanse the tripe, and pass it and a peeled onion through a mincing machine. Sprinkle with salt and pepper, and put in a saucepan with a little water. Simmer for three hours. Blend one and a-half tablespoonsful of flour smoothly with a cup of milk; add this to the tripe and stir till it boils. Simmer ten minutes longer and serve.

Cheese and Potato Pie.—3 or 4 large potatoes, ½ lb. dry cheese, pepper and salt, ½ teaspoon marmite, ½ pint water.

Method.—Peel and slice potatoes and grate the cheese; dissolve the marmite in the water; line a piedish with slices of potatoes, put a layer of grated cheese on these, and then another layer of potatoes, cheese again, and so on, until the dish is full, having potatoes on the top. Season each layer and then pour over the water and marmite. Cook slowly one hour.

Cucumbers with Parsley Sauce.—Peel the cucumbers and put them into boiling water, slightly salted, and cook for ten minutes. Drain well and cut into slices about an inch thick. Melt a little butter in a small frying pan, put in the cucumber and some fried sliced eschalot, salt and pepper, toss over the fire for a few minutes, then add a cupful of white sauce and chopped parsley. Cook gently for five minutes.

Steak and Kidney Pudding.—Take 1½ lb. stewing steak, 1 lb. bones, ¾ lb. flour, pinch salt, ½ lb. ox kidney, salt and pepper, 6 oz. suet, water or stock.

Wash bones, place in a saucepan and cover with cold water. Bring to the boil and skim, then season to taste and simmer for three hours. Cut steak and kidney into small pieces, roll in flour seasoned with pepper and salt to taste. Sift flour and salt into a basin. Mix in the shredded suet, and add enough cold water to make into a stiff paste. Cut off one-third of the paste for a lid.

Roll out remainder of paste, and line a greased pudding basin with it. Put in the steak and kidney. Almost fill basin with stock from the bones, or if you do not have bones, use water. Roll out paste for lid and fix over basin, pressing the edges well together. Cover with greased paper and then with a floured pudding cloth. Tie down with string. Place basin in a saucepan of boiling water to cover, put on the lid and boil for 3½-4 hours. Enough for six to eight persons.

Dried Fruit Tart.—One half cup seeded raisins, one half cup currants, one piece shredded lemon peel, dried apple, one tablespoon sugar, one half cup water, the juice and grated peel of half a lemon, nutmeg, and a little salt, one teaspoon of butter. Mince the apple, and boil all together for fifteen minutes, line a tart plate with pastry rolled thinly, put in the mixture when cold, and cover with pastry. Mark the edges neatly, brush the top with milk, and bake for about thirty minutes. Dried apple should be soaked the night before and cooked before adding to the other ingredients. Dried peaches or apricots can be used. The raisins and currants can be omitted, but add very much to the flavour and nourishing qualities of the tart.

A. H. Tucker, Government Printer, Brisbane.

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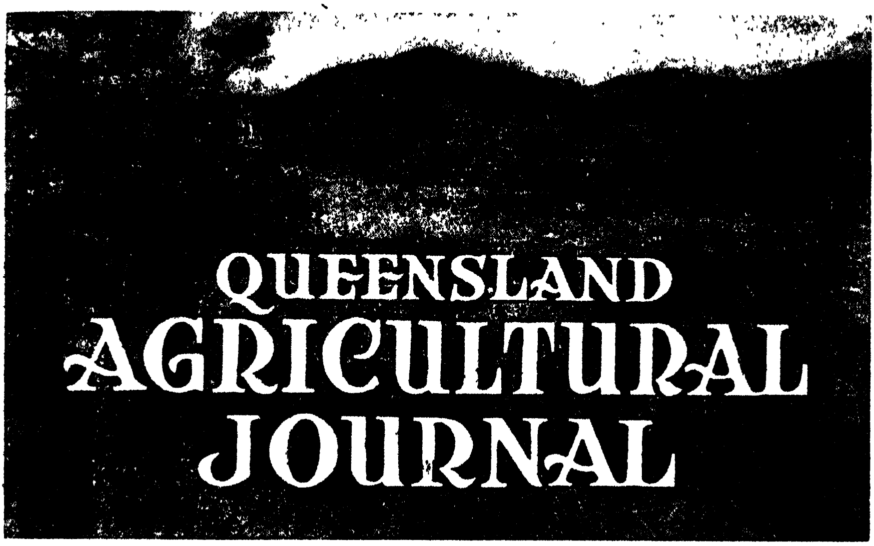

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Event and Comment.

Men Who Fight Hunger.

THE greatest benefactors of the human race, humanly speaking, are the men who fight hunger. In every age, man has striven for what are proclaimed to-day as the Four Freedoms of the Atlantic Charter, but none of those freedoms, especially freedom from want, is attainable without the brains, the skill, the will and the industry of the food producer. If it had not been for the men who fought hunger from the days of man's beginnings, the human race could not have survived; and it is the men who are fighting hunger to-day, who are ensuring the continuance of our race.

The men who fight hunger are not only those engaged in actual crop production. With them are others in the laboratory and in the field working on the problems of plant propagation, plant improvement and plant protection. Then there are the craftsmen in the engineering shop, at drafting board and bench, perfecting and producing machinery and implements without which the production of food could not be increased even under the stress of wartime urgency; and also the operators of our transport systems conveying essential supplies to the farm and to the factory. Then there are, too, the investigators who are finding out more nutritional facts, and formulating more efficient food preserving processes.

Men of science are working with the farmer on his No. 1 priority job of food production, and their work is a reminder of the work of other men of our own time, without whose genius and industry the fight against hunger to-day would be all the harder. Included among them are Farrer, Babcock, and a man named Mort. It was Farrer who bred a wheat which converted Australia from a grain-importing country into the third wheat-exporting country of the world. It was Babcock who gave the world, also without fee or

financial reward, the Babcock Test, a key to prosperity, and with it a new direction to the dairy industry. It was Mort who had the vision to investigate the possibilities of sending frozen meat to feed the people of Britain. As a result of his industry, Australia to-day is the second greatest meat exporter and the third greatest butter exporter of the world; in addition, Australia is Britain's largest individual supplier of eggs. These men were true missionaries of science, giving the best that was in them of genius and constructive effort for the benefit of mankind and their achievements are an inspiration to many others who to-day are fighting hunger.

The world's food supply has become a major problem. Demands on Australia's food resources are ever growing and the situation has now arisen that in the coming year, the demands will be very much greater than ever before. Consequently, in spite of practical difficulties in the way of increased production, the Australian food producer will undoubtedly do all he can to keep up essential supplies to the Services, to our own people and to the people of Britain.

After all, Australia, fortunately, is particularly well placed to provide much of the requirements of the Allied Nations, not only during the war, but after the war when the feeding of the starving populations of Europe and Asia will be the world's most urgent need. As far as our population limits will allow us, Australia will be all out in the vital job of essential food production.

With all co-operating in the food drive launched by the Prime Minister this month, Australia should be able to meet all her food commitments. Seasonal shortages may be expected, and more extensive rationing may be necessary among our own people, but the maintenance of a balanced diet for everyone should be assured.

So far in this war Australians have been singularly fortunate. In the main, at no time have we been actually short of nutritious foodstuffs, and, except for some reported difficulties in distribution, our living conditions have not been hard. Because of that, some, perhaps, may not find it easy to appreciate the lot of the hungry people of the lands which in the last four years have known all the horrors of war. For instance, the present diets of Belgium are estimated at 35 per cent. below standard in mere food energy, and the diets of Greece are worse still. The diets of France are listed at 25 per cent. below standard, Netherlands 20 per cent., Italy 15 per cent., and Norway 10 per cent. below standard in mere food energy. The situation in China is worse. There is no need to go into details of the terrible situation in parts of India, which is already being relieved to some extent by shipments of Australian wheat. Possibly, when the war is over, it will be found that the war-wracked and war-wrecked countries are barely sustaining the lives of their peoples. This distressing picture is a direct challenge to our hunger fighters, the food producers of Australia. With the United States and other civilised countries which have been able to maintain their food production capacity, we must shoulder our share of the burden and the duty of feeding a starving world, and the future peace of the world will depend to a large extent on the help which the more fortunate countries are prepared to give to the stricken nations.

Whatever the scale of rationing may be in Australia, there will be no shortage of food as the people of Britain know it, and especially as the peoples of the war-devastated countries know a shortage of food. So out of our comparative abundance, Australia will produce cheerfully and give generously, showing, at the same time, how Democracy works.

Field Crops

Pumpkins, Squashes and Marrows, and Grammas.

W. R. STRAUGHAN, Instructor in Agriculture.

PUMPKINS and grammas are essentially tropical plants and are extensively grown in all the warmer countries of the world. The more rapidly maturing squashes and marrows are, however, capable of being grown during the shorter summer seasons of more temperate regions and their cultivation extends to the northern countries of Europe and also into Southern Canada.

Besides their many culinary uses, these plants, particularly the pumpkins and grammas, are extensively used as stock food. In America certain types are largely grown for canning, and in Asiatic countries the rinds or shells were formerly widely used as carrying vessels.

In Queensland the plants under discussion have only comparatively recently achieved the popularity which they have so long enjoyed in the older countries of the world and where for centuries their nutritive value and relatively low cost of production have long been recognised. Pumpkins are much more extensively grown in this State than either the squashes and marrows or the grammas; a total of some 20,000 to 25,000 acres are now devoted every year to these crops.

Main Producing Districts.

Pumpkins are successfully grown in all the agricultural districts of Queensland but, at present, their production is concentrated in the more densely populated and intensively farmed areas of the south. The Lockyer Valley produces a large proportion of the State's table pumpkin requirements, and production in this locality consists largely of the cultivation of this type. The Fassifern Valley, the South Burnett, the Eastern Downs, the Brisbane Valley, Beaudesert, and the Central and Upper Burnett areas also produce extensive crops of both table and cattle types. In Central Queensland the limited pumpkin production is fairly evenly spread over the main agricultural areas, but Bowen alone has approximately two-thirds of the acreage devoted to the crop in North Queensland. In Western Queensland the low rainfall and other factors confine successful pumpkin production to market gardens. Squashes and marrows are mainly produced close to the larger towns—i.e., within easy reach of the consuming market—and they are usually grown in small, well-fertilized areas, which are frequently irrigated. The very small production of grammas is more or less confined to those areas in which pumpkins are grown.

Climatic and Soil Requirements.

The climatic and soil requirements of these plants are very similar to those of maize. Besides a rainfall sufficient to maintain growth without repeated or undue checks, the plants need warm days and nights, with an absence of frosts, for their optimum development. They are fairly tolerant of a high temperature provided it is not accompanied by a lack of soil moisture. A good friable loam with a high organic matter content is the most suitable soil for these crops, and this is the dominant soil type on which they are grown in the main producing districts. Other soil types may, however, be improved sufficiently by intelligent cultivation and adequate manuring to permit of the successful growth of pumpkins, squashes and marrows, and grammas. Generally speaking, sandy or light soils are the types that are most responsive to such treatment, but some stiff clays, provided their drainage is adequate, are also capable of being made highly productive. These crops will not tolerate badly aerated, wet, or acid soils and such soils must be avoided in their production. The frequently encountered supposition that any soil is good enough for the growth of the crops under discussion is quite erroneous, for they are all most responsive to good soil conditions.

The exceptionally rapidly developing and extensive root system of these crops indicates the necessity for a very high degree of tilth if satisfactory yields are to be obtained. Without such tilth, plant foods already existing in the soil in a natural state or added as fertilizers are of comparatively little value. Improvement in tilth, other than that achieved by cultivation, can be most effectively brought about in both light and heavy soils by the addition of farmyard manure. The alternative would be the ploughing under of a green manure crop, preferably a summer legume such as cowpea, or a combination of the ploughing under of the green manure and the addition of farmyard manure.

Plate 111.

A PUMPKIN CROP READY FOR HARVESTING.—Note how the foliage has been shed.

Even in highly-productive soils the addition of a green manure crop or farmyard manure is to be commended for, if no appreciable increase in yield is to be expected in the immediately following crops grown on such soils, fertility is maintained and the maintenance of fertility is a much less costly and a less difficult problem than its restoration should it once fall to a low level. Crop yields will usually increase with an increase in the amount of farmyard manure added to the ground but not proportionately. Heavy applications are therefore uneconomic, and since good response is obtained from light applications, dressings above 6 to 8 tons per acre should not be necessary. Where supplies are limited, and such is usually the case, they can be most economically utilized by spreading along the drill, or at the intended site of each hill, according to the method of sowing to be adopted. All farmyard manure should be well mixed with the soil by either ploughing or harrowing.

Liming.

Lime has many well-known desirable influences on the soil, and the crops under discussion are among those which may respond to an application of lime, but there are doubtless many cases in which no such application to these crops is called for. Increased yields of pumpkins, however, have been recorded where applications of as low as 3 cwt. of air-slaked lime per acre have been made. Nevertheless, dressings usually vary from 5 to 10 cwt. per acre according to the nature of the soil. A heavy or acid soil suggests the need of the heavier dressing whilst more friable loams require correspondingly smaller amounts. Lime should be applied two or three weeks prior to sowing and, as in the case of farmyard manure, should be thoroughly incorporated in the soil.

Fertilizers.

Fertilizers are very seldom used in pumpkin and gramma growing in this State, the soils on which these two crops are grown being generally regarded as sufficiently fertile for their requirements. Squashes and marrows are usually grown following some other market garden crop which has been fertilized, and their requirements are generally regarded as being supplied by the residual fertilizer. Furthermore, market garden soils are very frequently enriched by applications of farmyard manure, and the squashes and marrows also participate in residual effects therefrom.

Preparation of the Seed-bed.

As previously mentioned, these crops have a large and quickly developing root system. This is concentrated mainly in the uppermost 6 to 12 inches of the soil. Consequently the surface foot of soil should be loose and moist, and due regard should be paid to this requirement when preparing the land for sowing. The first essential is a deep and thorough ploughing which should be carried out early in the season and preferably before the June rains. Subsequent requirements in the preparation of the seed-bed will be determined by weather conditions and the farmer's individual experience of what is necessary to bring his particular soil to a high state of tilth. If practicable, the ground should remain open and in a rough condition for as long as possible through the winter. This will allow frost and other climatic influences to hasten the weathering of the soil, thus rendering large lumps friable. Then, when sufficient rain has fallen to supply adequate subsoil moisture, harrowing should effectively reduce the surface soil to a fairly fine physical condition. A second ploughing, preferably across and shallower

than the first, followed by the necessary surface harrowings to break all lumps, should then create the desired tilth. Such a tilth is obtained when the top 1 to 2 inches of soil is loose and finely divided and dry except just after rain has fallen. The soil immediately below, besides being sufficiently moist to ensure a quick germination, must be firm but not compacted. It must contain no large or hard lumps, but the soil particles must be associated in small aggregates or masses, giving the whole a rather uniformly granular or crumb-like structure. To obtain the desired condition, heavy soils require longer preparation than loams, and sandy soils need the use of rollers rather than of implements designed to stir the soil.

Sowing.

No definite time of sowing can be set down, but it may be accepted as normally extending from July to December, depending on the seasonal conditions usually experienced in the district in which the crop is to be grown. Since these plants are susceptible to frost, sowing must of necessity be delayed until all reasonable danger from frost is over and preferably until the soil is sufficiently warm to ensure a quick germination, for the seed is subject to decay in cold soils. It is considered that the lowest soil temperature at which the seed will germinate is 52 deg. F. or slightly higher than that required for maize. The most rapid germination is obtained when the soil temperature reaches 90 deg. F. In North Queensland soil temperatures may remain favourable for sowing throughout the year and sowing may therefore take place before July, but under South Queensland conditions sowing before that month is seldom practicable. Occasionally circumstances arise which render very late sowing desirable and such may be successful, for sowings in January and even in February have yielded profitable crops.

Two lb. of seed is usually required to sow an acre, but this rate will vary slightly with the variety to be sown. Large growing, strong running pumpkins and grammas will be sown further apart than the smaller squashes and marrows. Pumpkins and grammas are usually sown in drills 10 to 12 feet apart, seed being dropped singly at distances of 3 to 4 feet apart in the drill, or in hills of two or three seeds every 6 to 8 feet. The smaller squashes and marrows require only 4 to 5 feet between the drills and 2 feet between the plants in the drill. Seed may be sown by machine, but it is usually dropped by hand into open furrows, and later covered to a depth of 1 to 1½ inches. When sowing in hills, two or three seeds may be dropped into a hole made with a hoe or dibble. In hill sowing it is well to remember that two or three plants per hill will produce a greater number of fruit and more marketable fruit from a given area than one or more than three plants per hill. Frequently, sowings are made at much higher rates than these just mentioned in order to allow for loss by insect attack but, in these instances, the excess plants should be thinned out when the risk of such damage has passed.

In fertile districts enjoying a good rainfall pumpkins and grammas are sometimes grown with maize, but this practice is not generally successful in Queensland and is losing favour. When the crops are grown together, pumpkin or gramma seed is substituted for the maize seed in every third or fourth row, being sown either simultaneously with the maize seed or more frequently after the maize has germinated.

Occasionally plants are started in tubes in hot-houses, or in sheltered positions, and later transferred to the field. This practice may be

profitable where high prices can be realized for early-grown produce. The tubes are simply and quickly made from strips of galvanised iron or tin measuring 12 inches by 6 inches. These are formed into cylinders with the edges overlapping and are held in position by bands of string or other suitable material. These tubes are placed on end on a floor and filled with suitable potting soil, five to six seeds being sown in each. Following germination, the stand in each tube is reduced to the sturdiest two or three plants, and when these have developed three to four leaves the tubes are carried to the field and the seedlings transplanted. In handling the seedlings care must, of course, be taken to ensure that soil is not lost through the open lower ends of the tubes; if a light spade or sheet of iron is pushed under each tube before it is moved this danger will be obviated. In transplanting, a hole of suitable size is made at the site where the young plants are to be grown and the tube placed therein. The band of string is removed or cut and, after gently springing, the cylinder is removed. Finally the earth is firmed around the transplanted seedlings.

Cultivation of the Crop.

After the seed has germinated, the plants should be kept moving if heavy yields are to be obtained and inter-row cultivation should be sufficiently frequent to keep down weed growth and to loosen the ground after heavy rain. Under favourable conditions, the lateral root growth of pumpkins and their allied crops is rapid and, although root damage must be avoided, it is necessary to keep the soil beyond the root system well stirred. Consequently, some degree of care and judgment is essential in the inter-row cultivations which should continue until the growth of the vines prevents the use of implements. Generally speaking, spring, or even rigid tine implements will be found the most convenient to use for early cultivation. Diamond harrows are useful for the checking of early weed growth, but if such growth becomes troublesome disc implements may have to be employed. The actual implements used, however, will depend partly on what is available to choose from and partly on the prevailing conditions. The ordinary scuffler is probably all that is required for the final cultivation operations.

Flowering and Setting.

Early flowering depends on the strength and vigour of the young plants, and if growth is rapid flowering is early, with a consequential beneficial influence on yield. Flowering may extend over a period of several weeks, both male and female flowers being produced on the same vine. The male flowers are the first to appear and are borne on long, slender flower stalks not far from the crown of the plant. They are visible above the foliage. The female flowers are carried on short, stout stems towards the end of the runners, and are easily recognised by the ovary or undeveloped fruit which can be seen immediately below the flower itself.

The flowers are open for twenty-four hours, and pollination, which is usually effected by insects, chiefly honey bees, takes place mostly in the early morning, but may occur at any period when the flowers are open. Pollen is carried from the male flowers to the female flowers, and fertilization is thus effected. It is generally claimed that a better setting of fruit is obtained when cross pollination occurs. Setting evidently varies with the variety and to some extent with the strain within the

variety, and may be adversely affected by disease incidence. Only a small proportion of the female flowers set fruit, even though they may be fertilized. The shedding of fruiting flowers is therefore a natural phenomenon and cannot be corrected except by the selection of better strains and varieties in which the phenomenon is less marked than in those that are discarded in the selection. The nipping or cutting-back of vines is not calculated to increase the yield. It can only very slightly increase the size of the fruit set and removes potential fruit-carrying portions of the vine, an important point in view of the fact that all female flowers are borne towards the terminals of the runners.

Selection of Seed.

As has been pointed out, selected varieties or strains of these crops are capable of setting a greater number of fruit per vine than other varieties or strains and, therefore, besides providing higher quality fruit, selections are capable of improving yields. Indeed, selected strains are capable of out-yielding poor strains by over 30 per cent. The selection of individual fruit for seed requirements in the barn is unwise, since the fruit selected may be from low-yielding vines or may be exceptional individuals on a vine of poorly shaped fruit. It is therefore necessary for seed selection to be carried out in the field. This is not as laborious as it may at first appear, since, after the leaves have fallen, individual vines are fairly distinctively traced. Only well-shaped fruit, true to type, and from vines of high-yielding capacity should be selected. Ten lb. of pumpkin will provide approximately 1 lb. of seed, consequently, selections need not be extensive. Contrary to public opinion, the age of seed, provided its germination is not impaired, has no adverse influence on yield, for new season's seed has, by experiment, been shown to bear as heavily as seed of older origin.

Plate 112.

CATTLE PUMPKINS.

Harvesting.

Squashes and marrows are usually harvested before reaching maturity, that is, before the rind or shell commences to harden. A simple test can be applied by pressing the rind with the thumb nail which, if the fruit is at the correct stage for harvesting, should penetrate the rind under only light pressure. If the fruit is allowed to mature, the flesh becomes coarse and fibrous. The scallop type of bush squash is particularly good eating, when it is 2 to 3 inches in diameter and, when grown for home use, it is often picked at that stage in its devlopment; it is harvested, however, at a considerably later stage when required for the ordinary market. Pumpkins and grammas are harvested when mature, usually when the vines have died or been frosted. A short length of stalk should be left attached to the fruit when it is picked. It should not be broken off at the point of junction with the stalk for, if that is done, there will be a scar, which will allow the entry of decay organisms.

Storage.

All fruit to be stored must be mature, carefully handled and free from cuts and bruises which, as already indicated, allow the entry of decay organisms with consequential rapid rotting of the fruit. In storage, it is essential that the fruit be kept dry and as cool as practicable in order to prevent loss of moisture by sweating, for such sweating reduces the quality of the fruit and accentuates loss of weight. If stacked in bulk, one on top of the other, the fruit sweats and, of course, decays. Consequently, storage must be in single layers. Frequently, large haysheds provide sufficient space for the storage of pumpkins and grammas in single layers, but if sufficient floor space is not available to allow storage in that manner, wooden racks, which can be quickly and conveniently constructed, should be provided.

Varieties.

A great deal of confusion exists as to the correct classification of the many varieties of these crops, and the classification generally adopted in Australia differs markedly from that which is accepted in the United States of America. The pumpkins, the squashes and marrows, and the grammas belong to three species in the same genus, the squashes and marrows, as understood in Australia, belonging to one and the same species. These species are not always easily distinguishable one from the other, but distinctive vine and fruit characteristics are usually sufficiently apparent to enable an accurate classification to be made. It is considered that the differences between the species, in the classification adopted in Australia, are more clear-cut than would be the case in any other grouping of the varieties.

The vine, including the leaf stalk and the flower stalk, in the case of the pumpkins, is round or cylindrical and is not grooved and is a strong runner. It is hairy, whereas in the squashes and marrows it is spiny. The pumpkin leaf is rounded or kidney-shaped and is not cut into deep lobes. The fruit stalk is round and is fleshy or soft at maturity. The fruits are of various shapes, but never have crooknecks. They have hard shells, are late-maturing, and mostly store well. The pumpkin species includes the usually recognised table pumpkins, the cattle pumpkins, and the banana and hubbard pumpkins.

The stems of the squashes and marrows are five-sided, grooved, and spiny, and the flower stalks are also five sided. Their leaves are

distinctly lobed, the number of lobes varying from three to seven. The grooved fruit stalk, where it is attached to the fruit is frequently enlarged or flared and the fruit is hard at maturity, but the crop is usually harvested when the fruit is still tender. The squashes and marrows may be of the runner or bush type; usually the latter are the more extensively cultivated. The fruit, which matures early, may be of peculiar shape and does not keep well. This species includes the vegetable marrows, the scallops and bush squashes, the sugar squashes, the fordhook squashes and the crookneck squashes.

The grammas, like the pumpkins, are runners, and their stems may be angular. They are hairy but never spiny. Their leaves are lobed, but not markedly so, and whitish blotches appear at the intersections of the veins. The fruit stalk is angular and swollen where it joins the fruit, and the fruit, which is usually fairly hard-shelled, stores moderately well. The grammas are late-maturing and usually out-yield pumpkins in the warmer districts. The shape and colour of the fruit in the different varieties of grammas cover a wide range, but otherwise the gramma varieties are all very much alike. Many are used for pies and home jam making and all are very suitable as stock food.

The Queensland Blue or Beaudesert is a local table pumpkin that has gained popularity in both this and other States, and is now definitely the most widely grown variety in Queensland. It is of medium size, usually 8 to 10 lb. in weight and has a characteristic bronze-green colour. In shape, it is deep in relation to its width and is moderately deeply ribbed. The flesh is golden-coloured and of a fine firm texture. The seed cavity is small. This variety is usually a good cropper, but unfortunately the type is still variable. Improved strains have been selected, however, and these show much less variability. The Triangle or Triamble is a medium to large pumpkin of characteristic triangular shape. It is grey to grey-green in colour and has a deep golden-coloured flesh of fine and firm texture, but its reputed high flavoured eating qualities are not always present. The Ideal is a slightly ribbed, small, slaty-green table pumpkin. It has a very deep yellow-coloured, dry, and fine textured flesh. It is a fairly recent introduction from New South Wales, and may prove popular for its convenient size. An erstwhile very popular table pumpkin which has now been almost totally replaced by the Queensland Blue or Beaudesert is Ironbark. It is an extremely hard-shelled variety, with a golden-coloured flesh of very fine and firm texture. The Crown is another variety which is still grown fairly extensively. It is a slightly-ribbed, medium-sized pumpkin with a slate-coloured skin and a yellow flesh of good cooking quality. This variety now shows considerable variation in type, particularly as to the size and shape of the crown which appears at the blossom end.

Seed of individual varieties of cattle pumpkins is seldom procurable, cattle pumpkin seed being usually sold in lots of mixed varieties. All these varieties are large in size with large seed cavities and their flesh is usually coarse, pale and soft. The rind or shell is only of medium hardness, and consequently they are not very good keepers, and yields are generally not as heavy as in the case of the table varieties. Mammoth Cattle, Mammoth Yellow, and Mammoth Chili are the principal varieties found in paddocks of mixed cattle pumpkins.

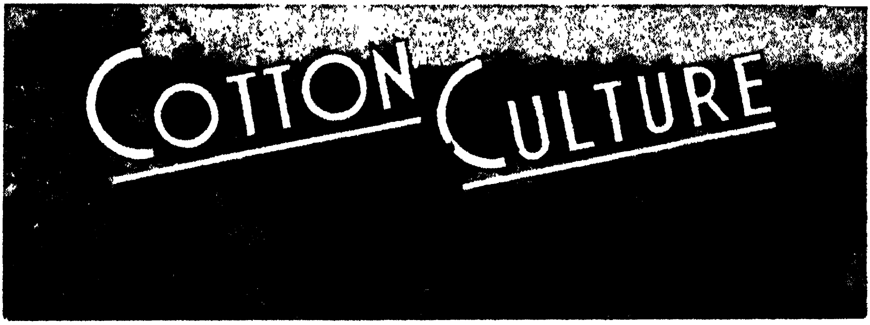
The hubbards are the earliest of the pumpkins to mature, and are very distinctively shaped, being pointed at both ends. Their rind is not as thick as in the table pumpkins, but hubbards store well, and are very popular in America for that reason. The Green Hubbard variety generally has a smooth dark-green skin but it is sometimes slightly warted. Its golden-yellow flesh is of fine texture and is dry and sweet. The Warted Hubbard, as its name indicates, is a larger, heavily warted variety with a dark green skin. Its flesh is orange-yellow and is inclined to be coarse-grained. Another hubbard variety is the Golden Hubbard, which is a small variety of a golden colour. It has a deep orange-coloured flesh and is the earliest maturing of the hubbards. The hubbards are used for table purposes.

The banana pumpkins are somewhat similar to the hubbards in shape, but are usually more elongated. They are generally greyish-green in colour and have a softer rind or skin than the hubbards. They are reputed to have a high flavour, but are not grown to any extent in Queensland. The chief varieties are the Banana and the Plymouth Rock.

The Early White, which is a very small white variety with ridged or scalloped edges, is possibly the most popular scallop marketed. It has a white flesh and is a very prolific and rapid bearer. The Early Golden Bush and the Golden Custard are two other varieties of scallop, but neither of them bear so prolifically as the Early White. The Long White Bush is one of the most popular of the larger marrows and is a long, smooth white variety with a white flesh. The Long Creamy Marrow and the Long Green Bush are two other vegetable marrows somewhat similar to the Long White Bush but, as their names indicate, they are of a cream and green colour respectively. Another type of bush marrow of recent origin is Zucchini, which is a dark green early-maturing variety.

The sugar squashes contain two large varieties usually classed as cattle pumpkins. They are Mammoth Tours, a large variety with rather distinctive mottled green and yellow markings, and Connecticut Field, a large variety very popular in America. A small, dark green, acorn-shaped fordhook squash with deep grooves is known as Table Queen. It possesses a rich orange coloured flesh of good flavour, and is reputed to be a prolific bearer. It is a recent importation from America, where it is claimed to be the most popular variety grown. Yellow Crookneck is a crookneck type usually reputed to be a heavy yielder. The skin is bright yellow in colour and is usually warted. Its flesh is a bright yellow colour.

The Bugle is the most extensively grown of the grammas, and is a long variety with a crooked neck and an enlarged end. It has a golden-coloured skin when mature, and the very sweet flesh is orange-coloured and of a fairly fine texture. It is the most popular variety for the making of jams and pies. A small gramma with slightly grooved papaw-shaped fruit is appropriately known as the Papaw variety. Its skin is at first green in colour, but it changes to a golden shade at maturity. It has a very deep orange-coloured flesh of a fine and fairly firm texture. Another gramma variety is that known as Large Cheese. It has a large, flat, round fruit somewhat similar in shape to an ordinary table pumpkin. Its skin is cream to golden-coloured, and it has a soft pinkish-tinged coarse-grained flesh. In America it is frequently used for canning. Two other large grammas are Mammoth Round and Giant Long, both of which are often found in paddocks of mixed pumpkins.



Cultivation of Cotton.

W. G. WELLS, Director of Cotton Culture.

ATTENTION has already been drawn in an article in the November issue of this Journal to the need of maintaining clean cultivation in the early stages of the growth of a cotton crop. It is equally important to maintain clean cultivation in a cotton crop as long as it is possible for a cultivating machine to pass down the rows without seriously damaging the plants.

Generally speaking, not more than three or four cultivations should be required after the one immediately following the thinning if cotton is grown in rotation with Rhodes grass; on old cultivations as many as ten may be required. At each of these operations it is recommended that the soil be worked to the plants, for not only does this help to control weed and grass growth, but a firm brace is established around the plants, which assists in preventing them from being blown over during severe storms when the soil is wet. Where the rows are planted on the level contour across the slope, this firm bracing of soil around the plants will also assist in retarding the run-off of storm waters.

The general tendency of the cotton growers of this State is to cease cultivating as soon as they see that a few branches are broken by the passage of the cultivator. It is very important, however, that the cultivation be continued until there is danger of serious damage being done to the crop. Cultivation, of course, should cease once the plants are large enough to be seriously damaged by the passage of the machine, but if it ceases before that stage of growth has been reached, then the plants will not be of sufficient size to break much of the force of beating storms. Most of the soils on which cotton is grown are of the heavy loam to clay loam type, and following beating storm rains their surface tends to set into a dry hard crust except in the first or possibly second season of cultivation after the breaking up of grassland. It is necessary, therefore, to cultivate as long as no serious damage is done to the plants, otherwise a crust will soon be formed in the wet season which, when dried out and set hard, will prevent much of the subsequent storms from penetrating efficiently into the subsoils. In addition, weeds and grasses will develop in the centres as a result of ceasing cultivation before the plants are large enough to provide sufficient shade to restrict such growths. These will quickly drain the moisture from the surface soils, thereby robbing the cotton plants.

The greatest efficiency should be obtained in the cultivating operations. This requires that the best type of cultivator equipped with the most suitable cultivating attachments be used at each operation. Unfortunately this phase of cotton growing is not given sufficient attention by many farmers in this State. Broadly speaking, the riding two horse drawn cultivator (Plate 113), which straddles the row of cotton and which the driver steers with his feet on the carriage supporting the tines, rather than depending entirely on guiding the horses, is the most suitable type of machine for cultivating cotton, especially young cotton. With a steady team this machine, of which there are several types manufactured, can be adjusted to cultivate and destroy weed growth very close to the row of plants. If it is used a sufficient number of times, much hand labour, other than thinning the cotton, can be eliminated in most seasons.

Plate 113.

DON'T NEGLECT THE LATE CULTIVATION OF A COTTON CROP.—Cultivation should be continued until the passage of the team and machine commences to cause serious breakage of the plants.

It is especially necessary that the cultivator be equipped to do efficient work at each operation. Attachments such as 6-inch sweeps, which are suitable for using in a loose loam in which young weeds are growing, will not be as suitable as long 2½ or 3 inch wide tines in a heavy clay soil which has recently been subjected to a hard beating storm and therefore requires a deep cultivation to re-establish a satisfactory mulch. On many farms the one set of attachments stays on the cultivator all the season, and often until the set is worn out. Tines, sweeps, duck feet and shovels all require seasonal resetting and sharpening of the cutting edges to make them suitable for performing efficient work, especially in weed-infested fields.

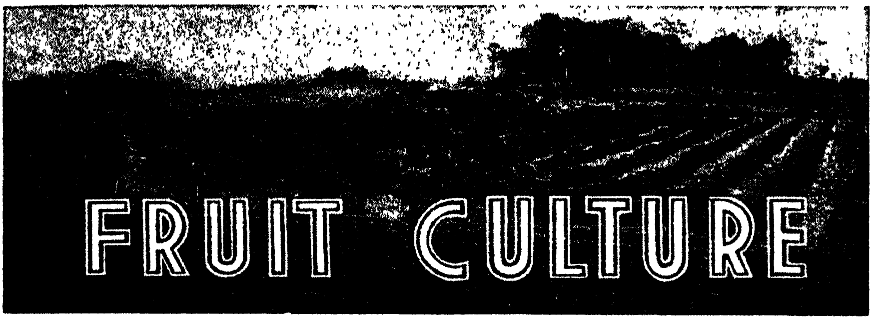
In recent seasons there has been a tendency for growers of large acreages of cotton to install cultivating equipment on light fast moving tractors. This is to be commended, for two rows can be cultivated at

the one trip, and the machine can be operated more continuously than horses, thus ensuring quicker and more economical cultivation. This greater rapidity of cultivation enables the operation to be started after the weed and grass seeds have germinated and to be completed before the weeds and grasses have got out of hand. It has been noted, however, that in an endeavour to cultivate a large acreage a day the tractor is frequently driven at such a speed that the cultivating attachments push the loose soil aside so much that they have to be set well away from the row to prevent covering small cotton plants. This prevents the destruction of weed and grass seedlings close to the plants that can be effected with the straddle row, foot steered cultivator drawn by a steady team of horses. Tractors should therefore be equipped with suitable guards when cultivating small cotton, to prevent the soil covering the plants, in which case efficient work can be done.

In some seasons sufficient rain may be experienced during the normal cultivating period to maintain satisfactory growth of the cotton plants and yet not germinate all of the weed and grass seeds in the soil. In such instances the crop may be kept clean to the point where it is "laid by" as the last operation with the riding cultivator is often named. Showery weather may soon after promote a thick stand of weed and grass seedlings which, if not destroyed, may grow sufficiently to affect appreciably the yield of the cotton crop. It is advisable, therefore, to cultivate the "middles" between the rows of cotton as long as a horse can pass down them without seriously damaging the cotton plants. The walking scuffler without a swingle tree is used for this purpose, very long traces being attached direct to the front hook of the scuffler, with a spreader inserted between them close behind the horse. The ends of the spreader should be wrapped with hessian to prevent their catching and breaking branches spreading away from the plants.

In other seasons prolonged wet weather may occur before the cotton crop is "laid by." In such instances sufficient time may elapse before the surface of a heavy alluvial soil is dry enough for cultivating, to allow of such an extensive development of weeds and grass that cultivating equipment cannot be used unless a riding disc cultivator is available. Under such circumstances the crop is frequently abandoned or ploughed out. It has been demonstrated in several seasons, however, that a badly weed and grass infested cotton crop can be satisfactorily cleaned up by ploughing out the middles and then destroying any big growths of weeds and grass between the plants by means of a heavy chipping hoe. A light pony plough set to plough shallow is used to make two or three rounds, throwing the soil to the centre. After the rows are chipped and the ploughed-out weeds and grass have dried out, the soil is ploughed back to the row to prevent excessive drying out of the soil around the plants. Where favourable growing conditions for the rest of the season are experienced, crops handled in this manner can produce profitable returns.

Undoubtedly the average yield of cotton could be appreciably increased if an improved standard of cultivation was more generally practised. Greater attention is required to such factors as timeliness of each cultivation, and the use of properly adjusted suitable cultivating attachments for each operation. All of these factors can materially increase the efficiency of the cultivating operations and thereby often reduce the amount of labour needed to produce a satisfactory crop of cotton.



Notes on Farm and Orchard Irrigation.

W. G. HANCOCK, Fruit Branch.

IRRIGATION is both a science and an art, and its successful and economic practice depends on a knowledge of a few scientific principles as well as keen observation and experiment on the irrigationist's own soil. These notes are intended to explain the principles of water application and usage, and to draw attention to a number of practical points in irrigation.

Water and the Soil.

The soil-water relationship is an extremely complex one, but it will be sufficient for the purpose of these notes to generalise it under three heads. First, there is the water so intimately associated with the soil particles that it cannot be separated by ordinary means and is quite unavailable to plant roots. It may be called hygroscopic water. Then, secondly, there is the water which soil particles gather around them as a film, and hold against gravity, as does a sponge which is just wet enough not to drip. This is called capillary water. A proportion of this is the water which plant roots obtain from the soil. The amount which a soil will hold as hygroscopic and capillary water is known as its "field capacity." This will vary widely according to the composition of the soil; for instance, the field capacity of sand is very low, while that of clay is very high. Thirdly, when soil is completely saturated, there is the water which has displaced the air and filled up the minute spaces between the particles. This water will more or less quickly drain away when it can, and is called gravitational water. If through faulty drainage this water remains in the soil, the site becomes a swamp in which all but the roots of specialised swamp plants will suffocate and die. Irrigation and good drainage must go together.

When water has been poured on a soil surface and is sinking in amongst the particles, the spaces between those of the first layer are filled and that layer is saturated. As it sinks in further and disappears beneath the surface the first layer of particles, while holding on to the capillary water, passes on the gravitational water to the particles below. The process continues until, given free drainage, there exists a more or less deep layer of soil at field capacity, but with no gravitational water. This is a fundamental point in irrigation—a given quantity of water will only bring a certain quantity of soil to field capacity; it cannot bring double that quantity to half field capacity.

Different types of soil take up hygroscopic water in varying amounts and likewise have different field capacities. Also, the absorption force

exerted by plant roots is not sufficient to overcome the retention force of soil particles beyond a certain point, and different types of soil will retain different proportions of their field capacities. A sandy soil has a small field capacity, but that little is mainly available to roots; a clay soil has a larger field capacity, but the proportion available to roots is smaller. Thus plants can wilt in a clay soil actually holding more water than a sandy soil in which they are still turgid. The point at which the retention force equals the absorption force is called the "wilting point." That introduces another maxim—that, practically speaking, water is either fully available or quite unavailable to roots.

Effective and Ineffective Irrigation.

To illustrate the effectiveness or otherwise of an irrigation, a theoretical example is taken. A figure to remember is that 1 inch of rain on 1 acre equals 22,700 gallons. If that amount were applied to 1 acre of citrus trees and the soil type were such that 1 inch of water brought 5 inches of soil to field capacity, all that water would be practically wasted, since citrus roots are below that depth, or should be. Much would be lost through evaporation, and any surface weeds would get the remainder. If, however, that amount were applied to a lettuce crop under similar conditions the lettuce would benefit, since, except for the unavoidable evaporation loss, the water would all be in their root zone.

Or course, in practice it is highly unlikely that the water would be so evenly applied that penetration would be an even 5 inches all over the acre. If applied in furrows or basins it would be localised and would sink much deeper at those places; but an undue proportion would be lost by evaporation and the trees would not be effectively irrigated. Actually, persistent under-irrigation of an orchard will tend to develop only shallow rooting, which renders trees susceptible to drought, the effects of high soil temperatures, nutritional troubles, and cultivation damage to roots. It is suggested that the restriction to root area caused by chronic under-irrigation is an aggravating factor in many soil deficiency troubles.

While general principles will remain the same, the actual application of water will depend on the root system of the crop and its water requirements, and the penetration and field capacity of a soil. The only way to decide the quantity required to penetrate to a given depth is to make trial holes with a spade after the water applied at an irrigation has been absorbed, and to vary the amount in future if on inspection the result is unsatisfactory. The shallow depth of penetration is frequently surprising, as it is to the gardener who after hosing his garden for an hour finds the water has only penetrated an inch or so. Actually a ¾-inch hose under a fair pressure will only pass about 300 gallons per hour, and as over 1,000 gallons are required to give 1 inch of water to half a square chain, long periods of hosing are necessary to water a fair-sized garden. This incidentally shows the futility of trying to irrigate an acre of orchard with a small windmill.

Of course, in general, shallow-rooted crops, such as most vegetables, require frequent but comparatively light applications of water; orchard trees require a very much heavier application at longer intervals, and if it is not possible to apply this amount within a reasonable time of pumping, it would be better to give the full supply to half the area alternately.

Loss By Evaporation.

Loss by evaporation is unavoidable and is quite considerable even under the best practices, while with less efficient methods it can be serious. However efficiently water is applied and soil managed, the water in the immediate surface layer must inevitably be lost. Therefore the percentage loss from this cause will be lessened as the depth of the moistened soil increases. For instance, on the assumption that the moisture in the top 2 inches of soil is evaporated the percentage falls from 100 for a 2-inch penetration to 8·3 in a 24-inch penetration. A penetration to the full depth of the root zone is therefore more economical, but it is also desirable, since roots tend to descend deeper, if (within the requirements of the crop) the tendency is for irrigation to a greater depth and lesser frequency.

Irrigation Systems.

Methods of applying water to the soil in common use include several types of spray systems, flooding, and furrows or basins.

For vegetables, fodders, and small crops in general, the spray systems have outstanding merits and are specially suitable for all crops requiring comparatively light but frequent watering. They are also the best for irrigating pineapples. The distribution of water is fairly even, and it is easy to regulate the quantity. Watering of slight slopes or undulating land presents no special difficulties, and once installed the labour required to operate at each watering is small. Once they are set working they can be left to flow without attention. Against these advantages is the fact that the capital cost is rather high. Opinions are divided as to whether they are the best method for orchard irrigation. In some circumstances the moist atmosphere generated may help in the development of fungus diseases. They also are rather awkward to instal amongst trees and when in position obstruct the passage of implements.

The usual layout requires a more or less permanent main from the pump to the cultivated area, with quickly adjustable coupling pieces along its length for attaching the movable spray lines. Into these lines nipples are screwed, from which the water is discharged into the air to fall like rain. Another variation, particularly suitable for pastures, is a movable spray line with semi-flexible joints, which can be dragged over sections of the land at a time.

Basins, furrows, or flooding all require semi-permanent or permanent flumes, piping, or ditches to carry the water to the place of use with a minimum of loss. From these, the water is reticulated into secondary furrows and applied to the land by whatever method is chosen. For level land which is not too porous, ditches will do; the correct fall can be obtained by running, if necessary, the ditch along the top of an embankment. For broken land or over very porous soil, sheet iron or wooden flumes or pipes are necessary to carry the water over depressions or prevent undue loss by percolation. To cross an obstruction such as a roadway, a concrete U can be constructed underground.

Another system described in American literature, but which has not been observed here, is a permanent underground main of concrete pipes from which rise at intervals vertical stand pipes adjusted for height, so that the tops shall be level. The water overflows from the open tops into furrows. This method would seem an excellent permanent installation for orchards.

For vegetables and small crops generally, the final application of water is often by furrows run between the rows and close to the plants. If it is necessary to work amongst the plants, successive waterings may be down every alternate furrow in turn, so that one furrow will always be comparatively dry. The porosity of the soil determines the length of the furrow; if over-long, the far end will receive too little water and the near end too much.

In orchards, one method is to draw up the soil in a circle around each tree, or in spaces containing two or more trees, and fill each in succession, usually commencing with the most distant, from a water furrow between the rows of trees. Such basins should be of ample diameter or width so that the whole root area will receive water. In some heavy soils where water remains around the trunk for an appreciable time, this method may induce crown rot, but for light or medium soils it is simple and satisfactory.

Another method is by running the water along a number of parallel furrows between the rows of trees; and yet another by forming large square basins between the trees—practically restricted flooding. The argument for these methods is that in an established orchard the feeding roots are mostly out beyond the spread of the branches and, therefore, the bulk of the water should be placed there.

The choice of systems will depend on several considerations. The chief point is to water as large a surface as possible, since the lateral spread of water in most soils is comparatively small. In general, it is desirable to give a light cultivation as soon as possible after an irrigation. For crops which receive a frequent watering, this usually cannot be done, but, in orchards which are irrigated comparatively heavily at longer intervals, the land should be cultivated as soon as practicable after each irrigation.

In any of these systems fertilizer can be applied by throwing a water soluble type into each basin or furrow as soon as it is filled, and the flow of water stopped.

Irrigation by actual flooding of larger areas requires that the land be perfectly level; and it is usually necessary to level the ground with a grader. The land is subdivided into suitable bays, about half a chain wide and of convenient length, by a low permanent ridge. This method is very suitable for lucerne or pastures, and also with suitable modifications for banana plantations, where frequent deep disturbance of the soil is undesirable.

Drainage.

Good subsoil drainage is most important on irrigated land, and land which does not answer to this requirement is quite unsuitable for irrigation. In all new cultivations intended for irrigation, test holes should be dug and filled with water to test the drainage. Poor drainage results in root injury; and dissolved salts in the irrigation water will accumulate in the soil and eventually render it infertile.

Sources of Water.

In large district irrigation schemes, the water is usually obtained from a river barrage, or dam, and the water conveyed by main canals to secondary canals and reticulated to individual farms. The individual farmer or orchardist may obtain his water from river or creek, either running or holding water in deep beds of sand so common in North

Queensland rivers; from swamp or lagoon; from wells or from "spears" driven into the sandy bed or porous water-bearing strata. From whatever source it is obtained, it is the flow or seepage which will usually determine the area possible to irrigate rather than the actual amount visible. If the flow is small it will be necessary to increase the capacity of well or soak pit. Wells can be increased in diameter or depth, or tunnels can be driven out from the bottom; the numbers of spears increased; or an old tank or boiler sunk into the sand of a river bed. For instance, a well 5 feet square and 20 feet deep at the water level will hold just over 3,000 gallons. This quantity will only suffice to give an inch of water to 1½ square chains, so unless the flow is sufficient to maintain a workable depth against the withdrawal of the pump, the area it is possible to irrigate would be very small. Obviously, it is very necessary to make sure that the supply will be maintained towards the end of the dry season when it will be most required.

Any untried source of supply should be tested for the presence of harmful salts before it is used on the land.

Engines and Pumps.

For the smallest type of installation, such as a garden, a windmill may supply sufficient water or it may be possible to use a hydraulic ram, in each case with a storage tank of ample capacity. However, for any commercial area a power-driven pump is necessary. Where electric power is available the advantages of an electric motor are obvious, but where it is not, the petrol, kerosene, or diesel engine may be used.

The merits of the centrifugal pump are such that one would hardly consider any other. It is compact and light in weight, powerful, and low in upkeep. It may be direct-coupled to an electric motor, or mounted in very confined positions. The centrifugal pump relies on the close fit of the impellor and requires to be driven at its designed speed to work at maximum efficiency and maintain its rated output. Air leaks between the pump and foot-valve will seriously reduce its efficiency and may even prevent it pumping. Sand in the water is an enemy to centrifugal pumps, unless specially designed. As it is desirable for the lift to be as low as possible, the pump may be mounted close to the water level, but it is not good practice for the belt drive to come directly from above; it should be as horizontal as practicable and usually the well can be cut into to permit this. A vertical drive from above reduces the transmitted power considerably because of the weight of the belt lessening the grip on the pulley. If no other is practicable, a vertical drive should be short. In horizontal drives, the drive side of the belt should be underneath. For very short drives, too short for flat belts, V belts are satisfactory. These run in grooves on the pulley and approximately 3 h.p. should be allowed to each belt.

Engine and pump should each be of a type suitable to the other. The engine should have ample power, so as to compensate for any small falling off in power with wear. Unless the farmer has the experience, it is wise to obtain technical advice regarding the installation, since many factors influence the output of a pump and hence the power required to drive it. Any engineering firm handling irrigation equipment will advise on the most suitable outfit.

The vertical height from water level to the highest point in the delivery line (i.e., the vertical lift), plus friction losses in the pipes, is the total "head." The greater the head the higher must be the speed

of the pump, and hence the power required. For practical purposes, the height from water level to pump should not exceed 25 feet at or near sea-level, but the nearer it can be to water-level the better. The suction pipe should be as straight and short as possible and of ample diameter. The delivery also should proceed straight from the pump without sharp bends. When the height from pump to the highest point of the delivery is great or the line very long, a non-return valve and an ample air chamber, fitted in the delivery line as near to the pump as possible, are desirable.

Friction losses in the pipes may be considerable, as shown by the following example. For a flow of 15,000 gallons per hour as delivered by an efficient 3-inch pump, the friction loss for different sizes of pipes per 100 feet of pipe is as follows:—

3″	3½″	4″	5″	6″	
28	13	6·5	2·74	1·1	ft. additional head.

This shows the very considerable effect of length of delivery pipe on the power requirements, which, however, can be adjusted to some extent by increasing the diameter of the pipe. For the smaller sizes it is desirable to have the pipes 1 inch larger than the pump.

The following example shows how to calculate the size of a pump for a job. A farmer plans to have at any one time a maximum of 15 acres of irrigated crops, and to pump eight hours per day. What sized pump will be required to enable the whole to be given 3 inches water per week?

3/7 (inches water per day) $\times$ 15 (acres) = 6 3/7 inches per day.

A 4-inch pump will deliver up to 8 inches in eight hours and would, therefore, be large enough and allow a margin. A 3-inch pump would deliver up to 5⅓ inches in the same period and would, therefore, be too small.

The power of the engine required, however, would depend on the total head, i.e., the vertical lift and the length and diameter of the pipes, and also the efficiency of the drive. It could range from a minimum of about 4 h.p. to many times this power for a very long line. This shows the desirability of having the installation planned by an expert.

The following table gives the approximate size of pump and horse-power required for different deliveries and heads for one well-known make of pump. The horse-power shown is, of course, that actually transmitted to the pump pulley, such as from a direct-coupled electric motor:—

Total Head.	Gallons per Hour.	Size of Pump.	R.P.M.	B.H.P. Required.
		Inches.		
10 feet	(a) 3,000–4,200	1½	1,350–1,690	1·2
	(b) 4,800–6,000	2	1,320–1,500	1·3
	(c) 6,600–9,000	2½	1,050–1,230	2·4
	(d) 10,200–15,000	3	980–1,250	3·9
	(e) 16,500–22,500	4	980–1,250	4·5
20 feet	(a)	1½	1,640–1,890	1·6
	(b)	2	1,530–1,750	2·0
	(c)	2½	1,270–1,400	2·8
	(d)	3	1,200–1,390	4·2
	(e)	4	1,140–1,350	5·6

Total Head.	Gallons per Hour.	Size of Pump.	R.P.M.	B.H.P. Required.
		Inches.		
30 feet	(a)	1½	1,900–2,110	1·9
	(b)	2	1,730–1,900	2·5
	(c)	2½	1,470–1,570	3·3
	(d)	3	1,360–1,540	5·2
	(e)	4	1,290–1,460	6·7
40 feet	(a)	1½	2,120–2,310	2·4
	(b)	2	1,900–2,060	3·0
	(c)	2½	1,640–1,720	3·8
	(d)	3	1,540–1,700	6·0
	(e)	4	1,430–1,570	7·8
50 feet	(a)	1½	2,320–2,450	2·8
	(b)	2	2,060–2,200	3·5
	(c)	2½	1,810–1,870	4·5
	(d)	3	1,715–1,850	7·2
	(e)	4	1,550–1,660	9·2

Useful Memoranda Not in Text.

Actual horse power required to raise water to different heights is—

$$\frac{\text{gallons per minute x 10 x total head in feet}}{\text{33,000 x efficiency}}$$

The efficiency of centrifugal pumps is approximately 50 per cent., so for purposes of estimation, the formula for horse power required is—

$$\frac{\text{G.P.M. x total head in feet x 2}}{\text{3,300}}$$

½ inch hose with nozzle at normal household pressures discharges approximately 200 gallons per hour.

¾ inch hose with nozzle at normal household pressures discharges approximately 300 gallons per hour.

Discharge of pipes 1,000 feet long at 1 foot head in gallons per minute—

½"	¾"	1"	1¼"	1½"	2"	2½"	3"	3½"	4"	5"	6"
·16	·45	·93	1·63	2·57	5·28	9·22	14·5	21·3	29·8	52·1	82·2

Discharge of pipes 50 feet long at 1 foot head in gallons per minute—

½"	¾"	1"	1¼"	1½"	2"	2½"	3"	3½"	4"	5"	6"
·715	2·01	4·17	7·29	11·49	23·6	41·21	64·81	95·21	133·21	232·89	367·43

N.B.—For a pipe less than 1,000 feet long multiply the figure for 1,000 feet by the following factor :—

50 ft.	100 ft.	150 ft.	200 ft.	300 ft.	400 ft.	500 ft.	750 ft.
4·47	3·16	2·58	2·237	1·827	1·58	1·414	1·154

1 imperial gallon weighs 10 lb., and contains 277·464 cubic inches.

1 cubic foot water weighs 62·35 lb., and contains 6·235 imperial gallons.

A column of water 1 foot high exerts pressure of ·434 lb. per square inch.

To convert heads in feet to lb. pressure multiply by ·434.

To convert 1 lb. pressure into feet head multiply by 2·3.

Pressure at sea level = 14·7 lb. per square inch, and equals a column of water 33·9 feet high.

In practice the maximum lift is approximately 25 feet.

1 inch rain equals 22,700 gallons per acre, approximately.

1 acre equals 10 square chains ,or 4,840 square yards.

Circles—Area .. .. = diameter^2 x ·7854.
Circumference .. .. = diameter x 3·1416.
Diameter .. .. .. = circumference x ·3183.

Capacity of circular tank in gallons = area of base in inches x height in inches ÷ 277·464.

Wartime Fruit Cases.

J. H. GREGORY, Instructor in Fruit Packing.

FRUIT producers in Queensland are at present experiencing many difficulties in obtaining enough suitable cases in which to market their products. It is no longer possible to obtain enough new cases, therefore increased use of second-hand cases has become necessary.

As growers well know, the types of cases used for marketing Australian-grown fruit in Queensland are many in number and variety. When supplied as second-hand cases in times of shortage, these cases, if new in type to growers, are likely to cause difficulties in packing. These notes are designed, therefore, to suggest to growers ways of using the various types of new and second-hand cases to the best advantage and so, as far as practicable, avoid difficulties which, otherwise, are sure to arise.

In using second-hand cases the first thing to do is to remove or obliterate all old brands. It is an offence against the *Fruit Marketing Regulations* to market fruit in cases on which the old brands are still discernible. Painting the ends is obviously the easiest way of obliterating old brands and marks. Growers who use case labels need not bother about obliterating brands, as the labels will cover them. Where a grower receives a variety of types of cases, he will avoid a lot of trouble in the packing of all fruits if he first sorts the cases into classes and uses each class for packing the fruits which will be found to pack easiest into the particular class or type. Cases available will probably be of the following types:—Standard; Dump; Long bushel; Half bushel standard; Half bushel dump; and Half bushel long (with partition).

Bushel Cases.

Most Queensland growers are familiar with both the standard and dump cases. The standard bushel case is an excellent container as a new box, but loses points when it becomes a second-hand case. It is customary for shopkeepers when removing its contents to open this case by taking off the side. This leaves the second-hand box with a bulging top and bottom which then become the sides unless the case is completely remade. Satisfactory packing under these conditions is difficult. In using this case, it is advisable to change the type of pack from the usual 3-3, 3-2, and 2-2 packs to 3-2 and 2-2 packs. Care should be taken to make each layer tight while packing. This type of case should, as far as practicable, be used for wrapped fruit only. It is anticipated that wrapping paper will be hard to get, so growers who can only wrap portion of their crop should use this case if they have them on hand among other kinds of cases. Common-sense handling is what is required.

As an all-purpose case, the dump bushel case—18 inches long by 8⅝ inches wide by 14 inches deep—is now the best available. All fruits packed in bushel cases are easy to pack. The shopkeeper invariably removes either the bottom or the lid when taking out the fruit. This leaves a box of a normal type, ready for re-use, with very little effort required to make it fit for packing.

The long bushel case is 26 inches long by 6 inches wide by 7⅛ inch deep, clear of the central partition. This case is popular for pear packing, so Queensland growers are not likely to have a large number supplied to them. If any grower does obtain long bushel cases, he is advised to cut them into half-bushel cases and use them as suggested in the notes on the long half-bushel case. As these cases are received in Queensland during the latter half of the year, it is safe to assume that

Stanthorpe growers should have them in time for the harvesting of stone fruits. As half bushels, they could be best used for the smaller fruits—such as cherries, apricots, and plums.

Half-bushel Cases.

The standard half-bushel case is 18 inches long by 11¾ inches wide by 5¼ inches deep. This case has been used often in Stanthorpe for packing grapes, for which it is quite satisfactory. The New South Wales gin case is similar, except for its hinged lid. Plums, apricots, and cherries, and other small fruits are easy to pack in this box. Tomatoes under 2¼ inches in size will come to the top if packed diagonally—3 layers deep, 3-3, 4-3, or 4-4- packs. Large-sized fruits are difficult to pack diagonally and often solid packs have to be used. With this pack, the fruit is placed in the case with the layers directly one upon another (Plate 114). It is therefore easily understood that with this type of pack, care should be taken to see that the fruit does not come higher above the top of the case than will permit of the lid being placed in position without unduly squeezing the fruit.

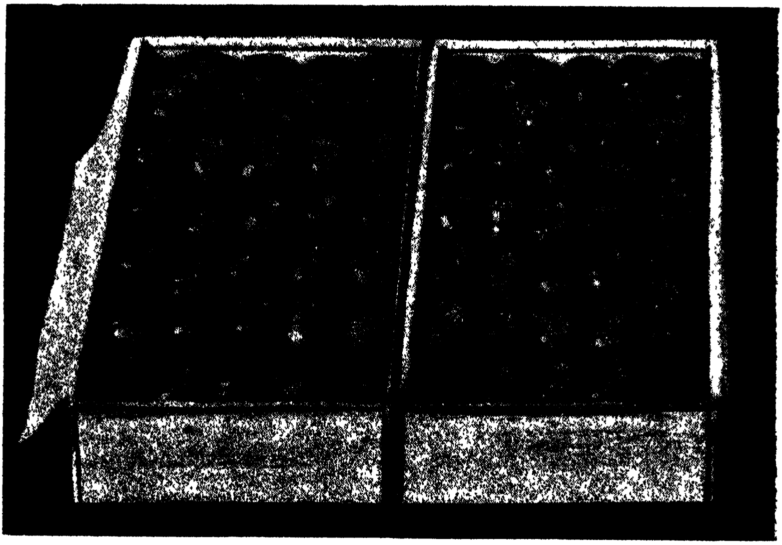


Plate 114.

HALF-BUSHEL STANDARD CASE.—Tomatoes packed on the layer-on-layer principle.

Large fruit over 2¾ inches may have to be packed by placing one layer on its edge, with the second layer placed on its flat upon it. Experienced growers do not welcome packs of this type and will, therefore, use them for marketing grapes or the smaller types of stone fruits. This will leave the half-bushel dump cases for tomatoes, large peaches, and other large fruits. The long half-bushel case is 26 inches long by 6 inches wide by 7⅛ inches deep (clear of partition). This is, perhaps, the oldest type of case in use in Australia, and may be used in the packing of most fruits, more or less satisfactorily. Its narrow width makes it a somewhat inconvenient container for packing. Packers should be careful, when placing bottom layers in position, to prevent the fruit from rubbing on the boards of the inside of the box which would cause skin

damage and early breakdown of the fruit. This case is best used for the smaller sizes of fruits, keeping the half-bushel dump cases for the largest and most awkward sizes over 2½ inches in size. With this case it is difficult to make an attractive pack. How to pack tomatoes in this case is described and illustrated in a booklet on fruit marketing, which is obtainable free on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

The half-bushel dump case is 18 inches long by 7¼ inches wide by 8⅝ inches deep. In all Queensland, except parts of the North, this case is well known and presents little difficulty in packing. Growers will find that keeping this case for packing the large, harder-to-pack sizes, would be well worth while.

Whilst the shortage of new and second-hand cases may be irritating, it is worth while remembering that unless every effort is made by all concerned to utilise as far as practicable the cases available, the case shortage will be accentuated and losses of much-needed fruit will result to the detriment of both the war requirements and the growers themselves.

There will probably be supplies of new cases made up of various types of timbers, such as plywood. Some of these may appear to be thinly cut, but these types of boards can only be milled from first-grade timber, but will under normal conditions give as much protection as thicker second-grade boards. In making up any of the makeshift timbers, growers would do well to remember to, as far as possible, place the boards close together down the centre of the tops and bottoms of the case. This will help to prevent pinching and damaging the fruit where it would normally be forced into the cracks by the pressure of the two-piece lids or bottoms.

A careful selection of fruit is also a consideration. There is no doubt that, in effect, many cases are wasted through growers using them to send poor-grade fruit to market. This fruit is rejected, which means in effect that later the case and transport are all wasted. Rejection of low-grades on the property will go a long way towards assisting maximum use of the available cases, whilst at the same time helping market conditions to maintain better values.

An appeal is made to growers during this crisis in shortage of case supplies to do their utmost to use the cases obtained to their best advantage, at the same time making every effort to keep up the quality of their packing. It will only be by doing this that a maximum use of transport with a minimum of waste will return to the nation the best of war efforts.

HANDY WEIGHTS AND MEASURES.

In order to prepare mashes which will give maximum results it is necessary for the various ingredients to be weighed. As scales are not available on all farms, the average weight of the various kinds of foodstuffs most commonly used is given for two convenient measures, the kerosene tin and the quart measure. These weights refer to the measures being filled, but not pressed.

Kerosene tin: Bran, 12 lb.; pollard, 18 lb.; lucerne meals, 12 lb.; maize (whole), 28 lb.; maize (cracked), 25 lb.; wheat and sorghum, 30 lb.

Quart measure: Barley meal, 1 lb. 8 oz.; bone meal, 1 lb. 12 oz.; bran, 8 oz.; maize (whole), 1 lb. 12 oz.; maize meal, 1 lb. 8 oz.; meat-meal, 1 lb. 8 oz.; linseed meal, 1 lb.; pollard, 1 lb.; salt (fine), 2 lb.; wheat, 1 lb. 12 oz.; wheatmeal, 1 lb. 8 oz.

Bushels to short ton: Maize, 35.7; barley, 40; sorghum, 33.3; wheat, 33.3; bran and pollard, 100; oats, 50.

Vegetable Production

Blood and Bone for Tomatoes.

L. G. VALLANCE, Assistant Research Officer.

BECAUSE of the acute shortage of chemical fertilizers which are sources of nitrogen and phosphate, an increasingly important part is being played by blood and bone in the production of tomatoes in the Redlands district. That this fertilizer is capable of supplying the needs of the plant with respect to nitrogen and phosphate has been amply demonstrated by a series of experimental plots in the Cleveland area. These trials, some of which are still in progress, have been designed with the object of determining the effect of various combinations of nitrogen, phosphate and potash upon tomato yields. A fundamental part of the work is the evaluation, by means of chemical analyses, of the plant food content of the soils. From these analyses the soils may be classified as being of high, medium, or low fertilizer requirements. While it is not intended in this article to anticipate the final results of these investigations, there are some features of the results already obtained which will be of interest to all growers who are endeavouring to obtain maximum yields from their quotas of fertilizer.

Excellent results were obtained from the trials in which blood and bone alone was used as a pre-planting fertilizer. In order to test whether the phosphate contained in the bone of the meatworks mixture was sufficiently rapidly available, some plots were included in the trials in which additional phosphate, as superphosphate, was added to the blood and bone. As no benefit either in plant growth or yield was obtained from the additional phosphate it is evident that blood and bone is capable of supplying the requirements of the tomato plant in respect to phosphate. Until details are available as to the most satisfactory amounts of meatworks fertilizer to be applied as a basal dressing, a tentative recommendation of one kerosene tinful (approximately 35 lb.), per five chain row, will be a guide to those growers who have had limited experience with this type of fertilizer. In some of the trials so far completed a basal dressing of 75 lb. of blood and bone per five chain row was given to an autumn planting of trellised Break o'Day variety. A yield of 1,700 cases per acre was obtained without the addition of further fertilizer, either at planting time or as a side dressing. However, in many of the plots on which this heavy application was used there were definite indications that an excessive quantity of very readily available nitrogen was present.

The importance of maintaining the correct balance between nitrogen and phosphate in the early stages of growth cannot be over emphasised. When a dressing of meatworks fertilizer greater than three-quarters of a kerosene tinful (approximately 28 lb.) per five chain row is placed in a

drill before planting, some time must be allowed to elapse before the plants are set out. During this interval the phosphate contained in the fertilizer will become more readily available because of the decomposition of the bone. Furthermore, since blood is quickly acted upon by soil bacteria, the nitrogen it contains will, to some extent, be incorporated in the soil organic matter, from which it is made available to plants comparatively slowly. Under the above conditions, meatworks fertilizer is capable of supplying a very suitably balanced ration of nitrogen and phosphate to the tomato plant.

Many growers are aware of the more obvious symptoms of excessive nitrogen application in the basal dressing. In the most obvious cases the plant is stunted and yellowish in colour. In addition the leaves are stiff with the leaflets small and often folded upwards. The condition is usually termed fertilizer "burn." If the injury is severe, the plant, although it does not die, will make practically no growth throughout the season. In less severe cases a lateral shoot will develop and grow normally while the remainder of the plant retains the original symptoms. However, very often these obvious symptoms are not present; there is no marked yellowing but the lateral growth is not vigorous, and the early leaves have a somewhat cramped appearance whilst the leaflets are characteristically small. If good growing weather prevails the plants will apparently recover and ultimately there will be no visible indications of the injury. Nevertheless, the yield of fruit will be adversely affected both as regards earliness and total weight.

The question then arises as to the length of the period which should be allowed to elapse before plants are set out where blood and bone has been used as a basal dressing. Actually this will vary according to the amounts of fertilizer used, the moisture present in the soil, and the nature of the subsequent working of the soil. Amounts exceeding three-quarters of a kerosene tinful (approximately 28 lb.) per five chain row when placed in the drill require a considerable amount of working to thoroughly mix the fertilizer with the soil. At least two scufflings are necessary in the first fortnight. This procedure should be followed by re-ploughing the drill, followed by another scuffling before planting. It is wise to take every opportunity of working, and so aerating, the soil in the row in order to ensure that maximum decomposition of the fertilizer material will take place. Frequent inspections to ascertain whether any lumps of rotting fertilizer are still present towards the bottom of the drill are also advisable. If any such are found the field is not yet ready for planting. Furthermore since the decomposition of the fertilizer is accelerated by the presence of adequate soil moisture, it is often advisable to give the land a watering after the fertilizer has been scuffled in, particularly if the soil is somewhat dry at the time. It should also be borne in mind that many of the fertilizer mixtures at present in general use contain a considerable proportion of their nitrogen as blood and the phosphate as bone. In consequence, therefore, when these mixtures are used as pre-planting fertilizers for tomatoes, precautions, similar to those outlined above, should be taken to ensure that the roots of the young plants do not come into contact with the fertilizer before a suitable amount of decomposition has taken place.

APPLIED BOTANY

Edible Trees and Shrubs.

3. QUEENSLAND BOTTLE TREE.*

W. D. FRANCIS, Botanist.

THE Queensland Bottle Tree is readily recognised by its characteristic bottle-shaped stem. It is met with in western parts of the State, mostly south of the tropics. It is a pleasing feature in the streets of several towns of the south-west, such as Augathella and Tambo. It belongs to the same plant family† as the common Kurrajong and the Brown Kurrajong.

Plate 115 shows the characteristic shape of the stem of the tree. The bark is brown or grey in colour and strongly fissured lengthwise. The wood is very soft. The leaves are placed alternately on the branchlets. On adult trees they are narrow, 2–4 inches long, and 3–5 times as long as broad. In the seedling stage of the tree and on coppice shoots the leaves are divided into 3–9 narrow, leaf-like segments. The flowers are about ½-inch in diameter when expanded. The fruit consists of 3–5 pod-like vessels. These are 1–1½ inch long, open in a slit on one side, and contain 4–15 seeds.

The tree is limited to Queensland and is found principally in the Darling Downs, Maranoa, Warrego, Port Curtis, Burnett, and Leichhardt districts. It approaches the coast near Marmor, south of Rockhampton.

The Queensland Bottle Tree is one of the best known and most valuable fodder trees of the State. All of the green parts are edible. It is commonly planted as a shade and ornamental tree in inland and coastal parts of the State. Large trees are often transplanted in western parts of the State. Attractive specimens growing in distant parts of western properties are often dug out, transported on lorries, and planted near homesteads. For this purpose the large roots are severed a few feet from the base of the stem.

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* *Brachychiton rupestris.*

† *Sterculiaceae.*

NOTICE TO READERS.

Because of the present necessity for strict economy in the use of paper, readers are requested to renew their subscriptions promptly. If renewals are unduly delayed, it may be impossible to supply back numbers of the Journal.

Address all renewals and other correspondence to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Plate 115.
THE QUEENSLAND BOTTLE TREE.

Queensland Trees.

THE BLACKBUTT.

THE Blackbutt* is one of the commonest trees of the coastal belt in Queensland from the Tweed River to Fraser Island. Though finding its greatest development on the coast it is occasionally found some distance away from it, as at Crow's Nest on the Darling Downs and the Blackdown Tableland inland from Rockhampton.

It is a large, handsome tree up to 150 feet high, frequently forming dense stands with long, straight boles. The stump or coppice leaves are not remarkably different from the adult ones, though at first they are opposite and sessile—*i.e.*, seated on the branchlet without any stalk; they are also markedly paler on the under surface than on the upper. They soon pass into the adult form. The adult or ordinary leaves are straight or somewhat sickle-shaped, 3–5 inches long, ¾-inch to 1 inch wide, and borne on a slender stalk of ½–1 inch. The flowers are borne in clusters on the old wood, the buds somewhat pointed. The seed capsules are globular, about ½-inch in diameter, mostly four-celled, with the valves over the cells rather small and about flush with the top.

On account of its availability, ease of working, and response under forestry management, Blackbutt is one of the favourite mill woods of Eastern Australia, though the timber is not so durable as some of the other Australian hardwoods. It is, however, reported that telegraph poles of Blackbutt erected at Maroochy were quite sound after forty years' service.

The Queensland Sub-department of Forestry proposes the name of Grey Blackbutt as the standard trade name for the timber and states it is applied to the purposes of floor framing of carriages or waggons and for waggon sheeting, for bridge planking, and for the crossarms of telegraph poles. In general building it is extensively used for floorings, weatherboards, plates, joists, and studs.

The vernacular, "Blackbutt," refers to the fact that the basal part of the trunk is clothed with a rather fibrous bark, frequently blackened by bush fires. The upper part of the trunk and limbs are clean and smooth. The Latin adjective, *pilularis,* is a diminutive from pila, a ball, and refers to the shape of the seed capsule.

* *Eucalyptus pilularis.*

ANSWERS.

Selected from the Government Botanist's outward mail.

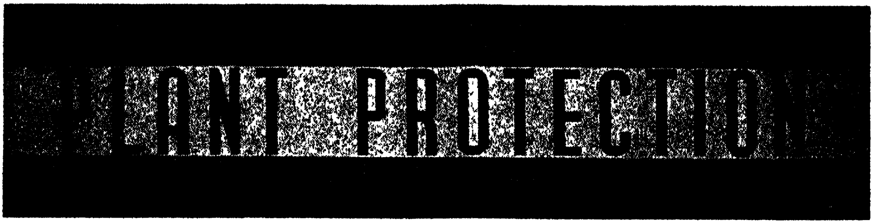
Specimens Named.

R.D.C. (Rockhampton)—

1. Strychnine Bush.—Feeding tests have shown definitely that this plant is poisonous to stock.
2. Fuchsia Bush.—Poisonous to stock. Contains a prussic acid yielding glucoside, which at times rises extremely high; at other times, paddock resting stock may feed on the plant with comparative safety.
3. Gallweed.—Suspected of poisonous properties, but feeding tests have always given negative results.
4. Yellow-wood.—Causes staggers in stock.
5. Cotton Bush.—Generally regarded as a comparatively reliable fodder in times of drought.
6. Damson or Plum-wood.—A good fodder.
7. Barrier Saltbush.—Generally regarded as a good fodder.
8. Cane Grass.—This grass contains a small amount of a prussic acid yielding glucoside, but unlikely to cause trouble.

Plate 116.
BLACKBUTT.

Plate 117.
LEAVES, FLOWER BUDS, AND SEED CAPSULES OF BLACKBUTT.



Four Major Diseases of Citrus.

F. W. BLACKFORD, Assistant Research Officer.

CITRUS has long been an important section of the fruit growing industry in this State and wartime food requirements have tended to increase its importance rather than otherwise. Hence it is considered desirable to publish an account of the various diseases of citrus and of the measures which are now being recommended for their control as the result of an extensive series of experiments which has been carried out by the Department of Agriculture and Stock during recent years. The four important diseases known as black spot, melanose, scab and brown spot are discussed in this issue.

Black Spot.

Black spot is probably the commonest disease affecting citrus in Queensland. All varieties may be infected by it but the disease is rarely found on Washington Navel oranges and grapefruit. The spots which are characteristic of this trouble are usually encountered on the fruit but similar spots may be found at times on the leaves and twigs. The disease is most prevalent on the warm sunny side of the trees and on the exposed side of the fruit.

On oranges, mandarins and grapefruit the first indications of the presence of the disease are roughly circular, reddish-brown spots which appear on the skin of the fruit as it approaches maturity or is commencing to colour. These spots develop to a size of about $\frac{1}{16}$ to $\frac{1}{8}$ inch in diameter and usually have a grey, sunken centre surrounded by a dark brown to black ring. Very small black pin-points, which are the fruiting bodies of the fungus causing the disease, may be found within the grey areas. (Plate 118.) Similar spotting is found on lemons but very often infections on lemon fruit merely produce quite small, shining, black spots which are slightly, if at all, sunken in the rind, and which do not develop further. Severe outbreaks have been known to cause extensive fruit shedding, but the main loss occasioned by the trouble is the grading down or culling of fruit because of the blemished rind. On fallen fruit and fruit held in storage for long periods a dry, dark-brown, shrivelled rot develops on affected portions of the rind. The flesh of the fruit is unaffected, however, and fruit rotting organisms seem to be unable to gain entry to the fruit through blemishes caused by the black spot fungus.

Melanose.

Next to black spot, melanose is the most important cause of the grading down of citrus fruit in this State. All varieties may be attacked and symptoms may be found on the leaves, twigs and fruit. In the early stages of the disease, brown, waxy spots appear on the surface of the fruit, leaves or twigs, these spots developing as a result of some of the surface cells becoming filled with a resin-like substance. It is at this

Plate 118.

BLACK SPOT.—Orange showing typical spotting; in the inset the spots are enlarged. Note the black pin-point fruiting bodies of the fungus in the centre of the spots.

stage in the development of the disease that it is difficult to distinguish between an orange or a mandarin fruit affected with melanose and one injured by Maori mite infestation. A good distinguishing characteristic, however, is provided by the fact that whereas a "Maori" fruit remains smooth, the surface of the resin-filled cells on a fruit affected by melanose lifts and cracks at the edges so that the rind is very rough and conveys the impression of a sandpaper surface.

The disease (Plate 119) is caused by a fungus which carries over from season to season on the dead wood on the tree and this fact accounts for its prevalence in old or neglected orchards in which the dead wood has not been pruned out. In showery weather or when heavy dews or fogs are prevalent, spores suspended in drops of water fall on uninfected leaves and fruit and, if the underlying tissue is susceptible, infection takes place. This is the reason why melanose spots are often found in circles outlining that portion of the leaf or fruit surface on which a water drop containing spores had rested, or in "tear streaks" marking

the track of a drop as it ran down over the surface of the fruit or leaf. One important point in connection with the incidence of this disease is that after the leaves and fruit are approximately six weeks old they are immune to attack from the melanose fungus. Hence as showery, warm conditions and heavy dews and fogs are of frequent occurrence in Queensland coastal citrus districts for a short time after the blossoming in spring, i.e., when the fruit is young and the trees have shot into young growth, the disease is invariably present in these areas in contrast to the inland districts, which usually have a dry spring, and in which the disease seldom appears to any extent.

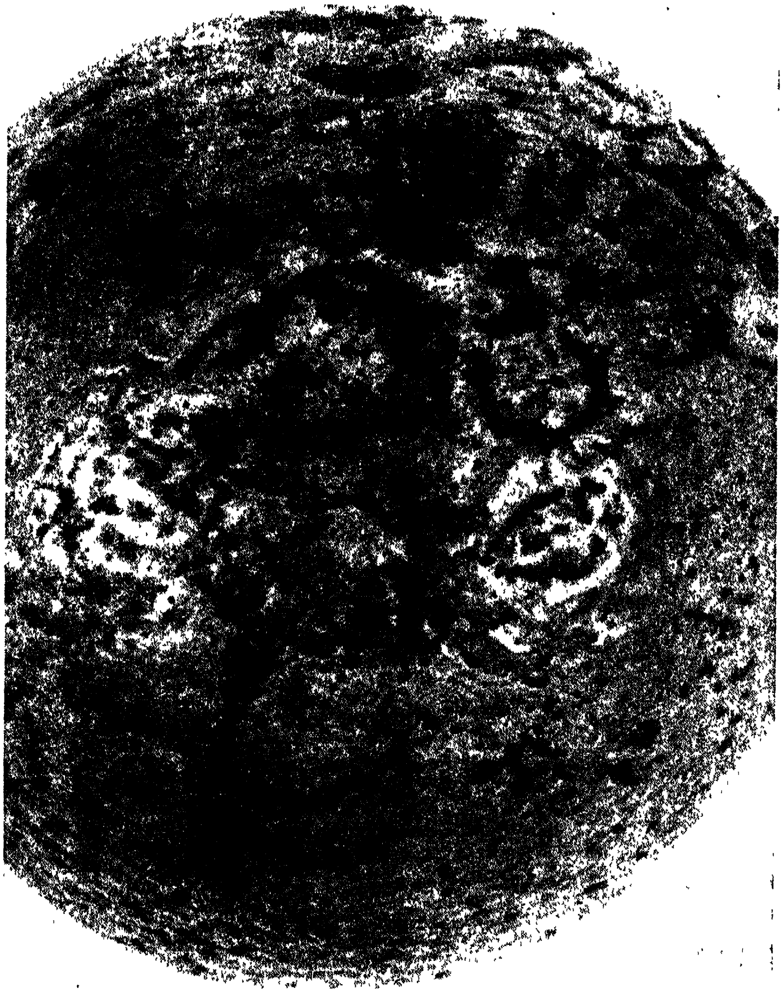


Plate 119.

MELANOSE.—Note how the melanose spots roughly outline the position where drops have rested on the rind.

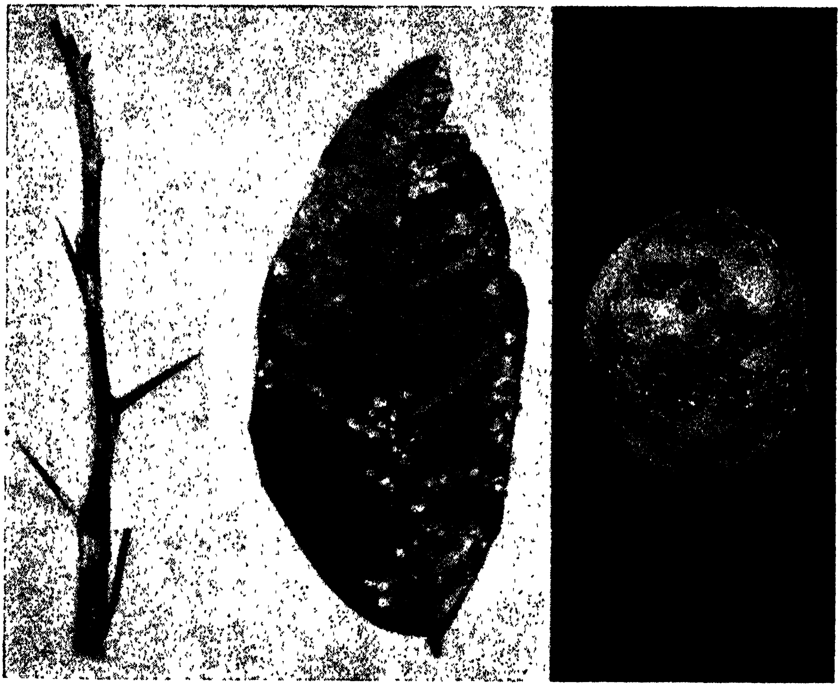


Plate 120.

SCAB.—Scabs on leaf, twig, and fruit of rough lemon.

Scab.

Scab is the name given to a disease caused by a group of fungi each of which produces very similar symptoms on citrus. Fortunately, there is only one variety of these fungi in Queensland and it is confined to lemons and mandarins. It can be particularly severe on rough lemon used as nursery stock, infection resulting in the production of very distorted seedlings unsuitable for budding purposes.

On the twigs (Plate 120) the disease appears as raised, light-brown, corky, scabby spots which are rather wartlike in appearance. Similar lesions are also produced on the leaves and fruit. On the leaves the disease results in marked distortion and may typically cause the leaf to appear as though the leaf blade had been pushed up from one side into a minute peak on the point of which the typical scab is found. Each scab is surrounded by a pale-coloured halo, giving the foliage a generally unhealthy light, yellowish-green appearance. Severely affected lemon fruit sometimes develop knobby outgrowths of the rind, each outgrowth being tipped with the corky scab. The disease is rarely serious in well-established mandarin trees, the main source of trouble in this variety of citrus being the infection of twig growth in young trees which results in the development of a badly shaped framework.

Brown Spot.

In Queensland, brown spot is confined to the Burrum and Elimbah districts. Only one variety of citrus, the Emperor of Canton mandarin, is attacked but in this variety the disease can be very destructive.

The most conspicuous symptom of the disease appears on the fruit as a small black dot on the rind which enlarges until it becomes a chocolate-coloured, sunken spot $\frac{1}{8}$ to $\frac{3}{8}$ inch in diameter, often with a raised area in the centre as though infection has taken place through some puncture. (Plate 121.) A spot may develop anywhere on the fruit, a very common place for its appearance being at the point of insertion of the stalk. Spotted fruit colour prematurely and are shed very readily and in severe outbreaks it is easy to pick out the Emperor variety in an orchard simply by noting the number of highly coloured fruit which are lying on the ground under the trees. Dark brown spots surrounded by a light-coloured halo may be found on the leaves and these cause distortion and leaf fall. The twigs may also be affected, dark-brown spots on them developing into small cankers as the wood matures. Affected twigs, particularly the affected tips of water-shoot growth, often die back with a characteristic curling over of the tip.

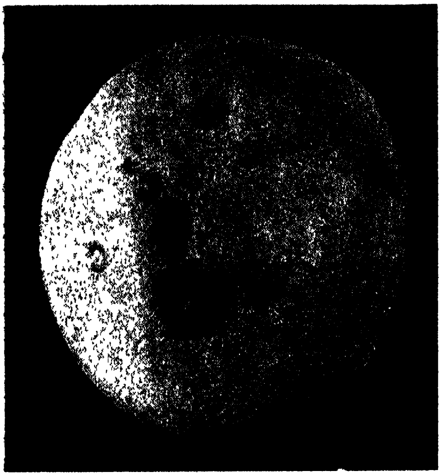


Plate 121.

BROWN SPOT.—Affected Emperor of Canton Mandarin Fruit.

Control.

The methods adopted for controlling the four diseases just discussed have several features in common. Firstly all diseased wood and infected fruit should be removed from the orchard and burned. As dead wood is either known, or suspected to be, the source of spores which spread the disease each season, it should be pruned out together with any sickly growth. To promote strong, healthy growth the orchard should receive good care and attention with respect to adequate fertilizer applications, green-manure cropping, cultivation and, if possible, irrigation.

While much may be accomplished by these methods it is necessary in certain districts, especially in those on the coast, to apply copper sprays in order to prevent infection developing. Home made cuprous oxide mixture at a strength of three gallons of the stock solution to forty gallons of water has been found the most suitable spray for this purpose. Both melanose and scab may be prevented by a single application of this spray as the fruit is susceptible to infection for only a very short period after setting. In the case of black spot and brown spot, however, the period of susceptibility is much longer and two and three applications respectively are necessary to achieve control. The following table sets out the number and time of the applications required in each of the four diseases. For successful control, it is important that these applications be made at the times shown and not delayed even for a short period.

Disease.	Time of Application of Spray.		
	½ to ¾ Petal Fall.	Two Months Later.	Late February.
Melanose ..	Cuprous oxide mixture (3–40)	..	..
Scab	Cuprous oxide mixture (3–40)	..	..
Black Spot ..	Cuprous oxide mixture (3–40)	Cuprous oxide mixture (3–40)	..
Brown Spot ..	Cuprous oxide mixture (3–40)	Cuprous oxide mixture (3–40)	Cuprous oxide mixture (3–40)

The above schedules have been drafted for the main crop of all citrus varieties set in the blossoming period of September and early October. These are usually the only sprays necessary; although lemons may blossom at other times during the year, the other principal crop of this variety set in late January and February will be free from disease providing these schedules are adhered to each year. Occasionally because of the adverse weather conditions some varieties, particularly the Late Valencia orange, may fail to set a main crop. Fruit set in the late blossoming which follows such an occurrence may be protected from black spot, which is usually serious in such a crop, by further applications of the fungicide in a schedule delayed according to the time of blossoming. In the case of rough lemon nursery stock, an application for the control of scab is necessary at each flush of young growth.

In most citrus districts there is usually a complex insect pest control problem which necessitates fumigation or spray applications. The copper spray applications required for disease control, however, may be incorporated in such an insect pest control programme and certain sprays combined to accomplish a two or threefold purpose. As, however, some precautions have to be observed, particularly where fumigation is practised, it is advisable for citrus growers, who may contemplate the adoption of a programme for the simultaneous control of several citrus diseases and pests to consult the combined citrus pest and disease control programmes as set out in a leaflet published by this Department.

CAUTION—DANGEROUS BACTERIA IN PRESERVED VEGETABLES.

Attention has recently been directed towards the possibility of contracting botulism from certain preserved foods, and housewives who bottle fruit and vegetables for consumption at a later date are now advised to take steps to eliminate the possibility of this type of food poisoning. Whilst most organisms likely to cause spoilage of the bottled product, or to render it dangerous for consumption, are killed in the ordinary cooking processes, some others, and in particular the bacterium responsible for botulism, may survive. This bacterium is associated with non-acid vegetables, and when the spores are not destroyed they may later grow in the container and produce a poison. There is no danger of botulism in the case of acid foods, and it is therefore prudent in the home to make use of this type only unless an efficient steam pressure canner is available. The addition of acids such as vinegar, citric acid, lemon juice, or the like cannot be used to overcome the trouble unless so much is added as to make a pickle in place of the normal preserve. It is therefore recommended that only acid foods be preserved by the usual home processes. The following list shows the class to which the more common foods belong:—

Acid foods (safe for home bottling):—Apples, apricots, cherries, gooseberries, peaches, pears, pineapples, plums, strawberries, and tomatoes and rhubarb.

Non-acid (unsafe unless processed in steam pressure canner):—Asparagus, beans (both dry and green), beetroot, carrot, sweet corn, peas, pumpkin, squash, sweet potatoes, and greens generally.

Queensland Butter Production.

E. B. RICE.

THE accompanying tables cover the operations of all butter factories in Queensland for the year ended 30th June, 1943. The information has been compiled and tabulated by Miss P. Horsley, of the Dairy Branch, from monthly returns to the Department in accordance with the requirements of the *Dairy Produce Act*. It will be noted that some factories, because of large local orders and, in many cases, the treatment of milk for Service requirements and otherwise, had only a comparatively small portion, if any, of their output graded officially.

A scrutiny of the figures indicates the quantity of butter in each grade made by the respective factories and the quantity of each grade for which suppliers were paid. The official gradings columns indicate the results of the gradings of butter examined officially by both Commonwealth and State officers. The information contained in these tables should prove of interest to factory suppliers, as well as to managers and directors.

SUMMARY OF PRODUCTION AND GRADINGS OF BUTTER FOR THE YEAR ENDED 30TH JUNE, 1943.

MANUFACTURE IN LB.

Total.	Choice.	First.	Second.	Pastry.
111,511,198 lb.	74,901,915 lb.	33,263,919 lb.	3,306,393 lb.	38,971 lb.
	67·17%	29·83%	2·96%	·03%

PAY IN LB.

Total.	Choice.	First.	Second.	Pastry.
112,010,699 lb.	76,459,478 lb.	32,886,149 lb.	2,634,399 lb.	30,673 lb.
	68·26%	29·35%	2·35%	·02%

OVERRUN.

Actual	2,976,595 lb. = 2·74%
Paid	3,476,096 lb. = 3·22%

GRADINGS IN BOXES.

Submitted as—	Choice.	First.	Second.	Pastry.
Choice.				
973,464	838,894	134,519	51	..
	86·17%	13·81%	·02%	..
First.				
495,878	..	475,419	20,459	..
	..	95·87%	4·13%	..
Second.	..	..		
57,513	..	..	51,035	6,508
			88·68%	11·32%
1,526,855	838,894 lb.	609,938 lb.	71,545	6,508
	54·94%	39·94%	4·68 %	·44%

Percentage of production graded = 76·65 per cent.

PRODUCTION PAYMENT AND GRADINGS OF BUTTER IN QUEENSLAND FOR THE YEAR ENDED 30TH JUNE, 1943.

Factory.		Manufacture and Payments in Lb.					Overrun.		
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Make Graded.
									Per cent.
Atherton	Make	2,604,979	2,604,979	..	..	..	72,872 lb.	71,672 lb.	..
	Pay	2,603,779	2,603,779	..	..	..	2·87%	2·83%	
Bushy Creek	Make	108,406	..	108,406	..	..	3,365 lb.	3,192 lb.	..
	Pay	108,233	..	108,233	..	..	3·203%	3·03%	
Daintree	Make	147,921	..	147,921	..	..	3,838 lb.	3,838 lb.	..
	Pay	147,921	..	147,921	..	..	2·66%	2·66%	
Evelyn Tableland ..	Make	515,537	515,537	..	..	..	18,647 lb.	16,919 lb.	..
	Pay	513,809	513,809	..	..	..	3·75%	3·404%	
Fraser	Make	1,965	..	1,965	..	..	Underrun	..	..
	Pay	4,919	..	4,919	..	..	2,954 lb.	..	
Millaa Millaa	Make	996,089	994,626	..	1,463	..	29,910 lb.	25,927 lb.	..
	Pay	992,106	990,983	..	1,123	..	3·09%	2·71%	
Gladstone	Make	1,686,846	215,439	1,226,226	245,181	..	31,081 lb.	38,553 lb.	79·204
	Pay	1,694,318	267,539	1,201,250	225,529	..	1·93%	2·32%	
Biloela	Make	3,337,446	1,072,462	2,192,099	72,885	..	88,107 lb.	89,468 lb.	64·529
	Pay	3,338,807	1,073,620	2,220,312	44,825	..	2·61%	2·65%	
Bundaberg	Make	2,056,724	585,785	1,346,891	124,048	..	24,593 lb.	40,555 lb.	64·306
	Pay	2,072,686	626,066	1,334,076	112,544	..	1·21%	1·99%	
Mackay	Make	886,488	302,751	543,403	13,838	26,496	16,766 lb.	30,116 lb.	4·097
	Pay	900,838	314,063	546,420	14,522	25,833	1·92%	3·46%	
Monto	Make	3,933,296	1,278,964	2,590,896	63,436	..	83,423 lb.	84,218 lb.	68·388
	Pay	3,934,091	1,281,707	2,603,666	48,718	..	2·16%	2·18%	
Rockhampton	Make	2,491,621	338,150	1,987,920	158,775	6,776	58·266 lb.	74,196 lb.	9·619
	Pay	2,507,551	432,232	1,931,157	141,636	2,526	2·39%	3·04%	

PRODUCTION PAYMENT AND GRADINGS OF BUTTER IN QUEENSLAND FOR THE YEAR ENDED 30TH JUNE, 1943—*continued.*

Factory.	Official Gradings in Boxes.									
	Submitted as Choice.				Submitted as First.			Submitted as Second.		
	Total.	Choice.	First.	Second.	Total.	First.	Second.	Total.	Second.	Pastry.
Atherton	..	..	..	..	..	..	..	..	..	..
Bushy Creek	..	..	..	..	..	..	..	..	..	..
Daintree	..	..	..	..	..	..	..	..	..	..
Evelyn Tableland	..	..	..	..	..	..	..	..	..	..
Fraser	..	..	..	..	..	..	..	..	..	..
Millaa Millaa	..	..	..	..	..	..	..	..	..	..
Gladstone	..	..	..	..	19,225 ..	19,071 99·2%	154 ·8%	4,633	4,331 93·48%	302 6·52%
Biloela	8,521	5,318 62·41%	3,203 37·58%	..	29,112	28,709 98·61%	403 1·38%	825	692 83·88%	133 16·12%
Bundaberg	1,787	433 24·23%	1,354 75·77	..	19,929	19,810 99·40%	119 ·6%	1,902	1,812 95·27%	90 4·73%
Mackay	..	..	..	..	46	..	46 100%	601	226 37 6%	375 62·39%
Monto	12,919	12,064 93·38%	855 6·62%	..	34,207	34,171 99·89%	36 ·105%	908	770 84·80%	138 15·19%
Rockhampton	..	..	..	..	2,407	1,786 74·2%	621 25·8%	1,873	1,443 77·04%	430 22·95%

PRODUCTION PAYMENT AND GRADINGS OF BUTTER IN QUEENSLAND FOR THE YEAR ENDED 30TH JUNE, 1943.—*continued.*

Factory.		Manufacture and Payments in Lb.					Overrun.		
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Make Graded.
									Per cent.
Wowan	Make	2,588,202	419,624	2,078,045	83,757	6,776	62,372 lb.	62,954 lb.	56·369
	Pay	2,588,784	508,356	2,003,307	74,593	2,526	2·46%	2·49%	
Silkwood	Make	46,567	..	43,836	..	2,731	417 lb.	..	..
	Pay	46,150	..	43,836	..	2,314	·9%	..	
Caboolture	Make	2,545,238	2,204,030	325,584	15,624	..	67,971 lb.	70,624 lb.	74·416
	Pay	2,547,891	2,258,021	279,190	10,680	..	2·78%	2·85%	
Eumundi	Make	2,248,109	1,974,289	253,244	20,576	..	60,557 lb.	60,363 lb.	91·389
	Pay	2,247,915	2,008,299	224,751	14,865	..	2·76%	2·75%	
Pomona	Make	1,548,340	1,384,122	150,846	13,372	..	41,884 lb.	42,526 lb.	100
	Pay	1,548,982	1,421,461	121,986	5,535	..	2·77%	2·82%	
Dayboro'	Make	47,052	..	47,052	..	..	Underrun	..	17·138
	Pay	365,166	282,731	82,435	..	..	318,114 lb.	..	
Esk	Make	2,098,929	1,189,797	847,681	61,451	..	67,056 lb.	67,126 lb.	91·798
	Pay	2,098,999	1,194,578	863,904	40,517	..	3·3002%	3·303%	
Logan and Albert ..	Make	3,611,375	3,147,695	463,680	..	..	108,549 lb.	108,616 lb.	94·782
	Pay	3,611,442	3,176,482	433,101	1,859	..	3·09%	3·1%	
Maleny	Make	2,496,550	2,371,446	125,104	..	..	75·041 lb.	73,848 lb.	83·209
	Pay	2,495,357	2,380,276	114,182	899	..	3·09%	3·05%	
Munro Bros, Sold Oct., 1942	Make	151,457	80,393	70,116	948	..	2,003 lb.	1,901 lb.	100
	Pay	151,355	88,724	62,226	405	..	1·34%	1·27%	
College	Make	79,413	10,527	10,527	..	..	1,217 lb.	1,153 lb.	31·732
	Pay	79,349	75,465	3,800	84	..	1·55%	1·47%	

PRODUCTION PAYMENT AND GRADINGS OF BUTTER IN QUEENSLAND FOR THE YEAR ENDED 30TH JUNE, 1943.—*continued.*

Factory.	Official Gradings in Boxes.									
	Submitted as Choice.				Submitted as First.			Submitted as Second.		
	Total.	Choice.	First.	Second.	Total.	First.	Second.	Total.	Second.	Pastry.
Wowan	1,698	1,411 83·09%	287 16·9%	..	22,862	22,862 100%	..	1,493	1,108 74·21%	385 25·78%
Silkwood	..	..	..	..	..	..	..	..	..	..
Caboolture	27,747	25,486 91·85%	2,261 8·14%	..	5,876	4,627 78·74%	1,249 21·25%	200	131 65·5%	69 34·5%
Eumundi	31,749	18,001 56·69%	13,748 43·30%	..	4,613	3,515 76·19%	1,098 23·80%	326	295 90·49%	31 9·51%
Pomona	26,444	25,301 95·67%	1,143 4·32%	..	3,578	3,311 92·53%	267 7·46%	225	210 93·33%	15 6·67%
Dayboro'	..	..	..	..	144	137 95·13%	7 4·87%	..	..	..
Esk	20,691	19,948 96·40%	743 3·59%	..	12,573 ..	12,473 99·20%	100 ·79%	1,143 ..	1,050 91·86%	93 8·14%
Logan and Albert	52,864	48,645 92·02%	4,219 7·98%	..	8,225	7,083 86·11%	1,142 13·88%	35	17 48·57%	18 51·42%
Maleny	34,874	25,136 72·07%	9,738 27·92%	..	2,222	2,043 91·94%	179 8·05%	..	..	..
Munro Bros. sold Oct., 1942	1,461	1,167 78·8%	294 21·2%	..	1,311	1,311 100%	..	10	5 50%	5 50%
College	262	106 40·46%	156 59·54%	..	184	166 90·2%	18 9·78%	..	..	..

PRODUCTION PAYMENT AND GRADINGS OF BUTTER IN QUEENSLAND FOR THE YEAR ENDED 30TH JUNE, 1943.—*continued.*

Factory.		Manufacture and Payments in Lb.					Overrun.		
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Make Graded.
									Per cent.
Booval	Make	3,332,646	2,480,229	599,119	252,682	616	126,239 lb.	126,618 lb.	57·367
	Pay	3,333,025	2,421,284	741,729	170,012	..	3·93%	3·94%	
Boonah	Make	3,708,354	2,393,649	1,203,125	111,524	56	108,687 lb.	108,718 lb.	96·125
	Pay	3,708,385	2,481,763	1,148,005	78,617	..	3·01%	3·02%	
Grantham	Make	2,215,175	1,434,338	588,421	191,968	448	90,992 lb.	91,134 lb.	94·302
	Pay	2,215,317	1,494,138	581,815	139,364	..	4·28%	4·29%	
Laidley	Make	1,867,557	1,470,314	360,596	36,647	..	61,687 lb.	61,870 lb.	96·389
	Pay	1,867,746	1,516,246	328,429	23,071	..	3·41%	3·42%	
Lowood	Make	598,983	252,093	337,585	9,193	112	8,461 lb.	17,537 lb.	93·519
	Pay	608,059	254,397	334,514	19,148	..	1·42%	2·95%	
Kingston	Make	5,209,628	4,636,188	443,016	130,424	..	186,191 lb.	185,739 lb.	100
	Pay	5,209,230	4,662,652	441,484	105,094	..	3·706%	3·69%	
Woodford	Make	1,790,700	1,680,820	109,648	232	..	69·539 lb.	70,184 lb.	92·01
	Pay	1,791,345	1,668,612	122,321	412	..	4·04%	4·07%	
Cooroy	Make	2,049,570	1,430,098	588,840	30,632	..	69,480 lb.	68,139 lb.	91·864
	Pay	2,049,229	1,537,102	495,062	16,065	..	3·508%	3·44%	
Gympie	Make	7,695,054	7,085,341	522,872	86,841	..	235,231 lb.	236,817 lb.	83·88
	Pay	7,696,650	7,217,800	411,186	67,664	..	3·15%	3·17%	
Murgon	Make	2,749,091	2,353,171	389,760	6,160	..	69,407 lb.	71,143 lb.	83·274
	Pay	2,750,827	2,333,786	413,279	3,762	..	2·59%	2·65%	
Proston	Make	1,339,295	833,503	412,888	92,904	..	30,875 lb.	28,737 lb.	100
	Pay	1,337,157	877,173	380,976	79,008	..	2·35%	2·19%	

PRODUCTION PAYMENT AND GRADINGS OF BUTTER IN QUEENSLAND FOR THE YEAR ENDED 30TH JUNE, 1943.—*continued.*

Factory.	Official Gradings in Boxes.									
	Submitted as Choice.				Submitted as First.			Submitted as Second.		
	Total.	Choice.	First.	Second.	Total.	First.	Second.	Total.	Second.	Pastry.
Booval	18,863	16,944 89·83%	1,919 10·17%	..	10,686	10,265 96·06%	421 3·94%	4,591	4,186 91·18%	405 8·82%
Boonah	40,227	37,820 94·02%	2,407 5·98%	..	21,497	20,839 96·94%	658 3·06%	1,931	1,748 90·52%	183 9·47%
Grantham	23,583	17,926 76·01%	5,657 23·98%	..	10,327	10,171 98·48%	156 1·51%	3,393	3,350 98·73%	43 1·27%
Laidley	24,439	18,453 75·50%	5,986 24·49%	..	6,800	6,434 94·61%	366 5·38%	906	811 89·51%	95 10·48%
Lowood	3,949	3,590 90·9%	359 9·1%	..	5,893	5,851 99·2%	42 ·8%	161	117 72·6%	44 27·4%
Kingston	86,322	77,516 89·79%	8,806 10·2%	..	6,916	6,847 99%	69 ·99%	2,444	2,343 95·86%	101 4·14%
Woodford	26,885	12,795 47·59%	14,090 52·4%	..	2,537	2,236 88·13%	301 11·86%	2	..	2 100%
Cooroy	22,410	21,890 97·67%	520 2·32%	..	10,591	10,470 98·85%	121 1·14%	621	461 74·23%	160 25·76%
Gympie	118,776	115,599 97·32%	3,177 2·67%	..	9,779	7,112 72·72%	2,667 27·27%	1,685	1,301 77·21%	384 22·79%
Murgon	33,732	28,429 84·27%	5,303 15·72%	..	7,061	6,902 97·74%	159 2·25%	87	70 80·46%	17 19·54%
Proston	14,578	12,558 86·15%	2,018 13·84%	..	7,616	7,244 95·11%	372 4·88%	1,705	1,675 98·24%	30 1·75%

PRODUCTION PAYMENT AND GRADINGS OF BUTTER IN QUEENSLAND FOR THE YEAR ENDED 30TH JUNE, 1943.—*continued.*

Factory.		Manufacture and Payments in Lb.					Overrun.		
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Make Graded.
									Per cent.
Nanango	Make	2,273,142	955,189	1,268,894	49,059	..	78,466 lb.	78,997 lb.	96·25
	Pay	2,273,673	1,032,328	1,201,755	39,590	..	3·57%	3·59%	
Maryborough	Make	995,072	467,958	470,918	56,196	..	25,444 lb.	22,599 lb.	22·184
	Pay	996,227	451,593	493,854	50,780	..	2·61%	2·31%	
Biggenden	Make	2,056,877	1,406,268	622,049	28,560	..	85,101 lb.	85,426 lb.	77·819
	Pay	2,057,202	1,477,109	566,234	13,859	..	4·31%	4·33%	
Kingaroy	Make	4,143,915	4,022,512	..	121,403	..	179,330 lb.	180,820 lb.	33·495
	Pay	4,145,405	4,037,247	..	108,158	..	4·52%	4·56%	
Mundubbera	Make	2,661,200	2,317,472	304,920	38,808	..	94,403 lb.	94,386 lb.	90·062
	Pay	2,661,183	2,360,170	274,976	26,037	..	3·67%	3·67%	
Wondai	Make	2,401,798	1,923,011	414,026	64,761	..	112,529 lb.	114,198 lb.	75·45
	Pay	2,403,467	1,973,089	394,110	36,268	..	4·91%	4·98%	
Gayndah	Make	1,558,579	1,098,655	440,344	19,580	..	58,004 lb.	57,892 lb.	92·592
	Pay	1,558,467	1,093,431	448,121	16,915	..	3·86%	3·85%	
Chinchilla	Make	1,843,183	1,358,727	417,032	65,856	1,568	17,761 lb.	22,675 lb.	95·318
	Pay	1,848,097	1,390,588	412,399	45,110	..	·97%	1·24%	
Toowoomba	Make	2,483,889	2,104,379	334,488	45,022	..	7,255 lb.	81,505 lb.	50·661
	Pay	2,558,139	2,168,840	343,998	45,301	..	·29%	3·29%	
Clifton	Make	1,390,592	671,048	686,952	32,592	..	35,514	35,818 lb.	93·077
	Pay	1,390,896	672,276	689,260	29,360	..	2·62%	2·64%	
Crow's Nest	Make	1,678,600	1,187,368	489,664	1,568	..	48,976 lb.	49,142 lb.	98·872
	Pay	1,678,766	1,187,369	489,844	1,553	..	3·005%	3·01%	

PRODUCTION PAYMENT AND GRADINGS OF BUTTER IN QUEENSLAND FOR THE YEAR ENDED 30TH JUNE, 1943.—*continued.*

Factory.	Official Gradings in Boxes.									
	Submitted as Choice.				Submitted as First.			Submitted as Second.		
	Total.	Choice.	First.	Second.	Total.	First.	Second.	Total.	Second.	Pastry.
Nanango	15,871	11,950 75·29%	3,913 24·65%	8 ·05%	22,218	20,998 94·51%	1,220 5·49%	981	655 66·77%	326 33·23%
Maryborough	710	51 7·18%	659 92·81%	..	2,385	1,029 43·14%	1,356 56·85%	847	431 50·89%	416 49·11%
Biggenden	16,753	14,500 86·55	2,253 13·45%	..	11,136	10,335 92·81%	801 7·19%	694	616 88·76%	78 11·24%
Kingaroy	22,669	20,389 89·94%	2,280 10·05%	..	32	32 100%	..	2,085	1,767 84·74%	318 15·25%
Mundubbera	36,719	32,616 88·82%	4,103 11·17%	..	5,315	4,160 78·26%	1,155 21·73%	765	703 91·89%	62 8·1%
Wondai	24,142	21,622 89·56%	2,520 10·43%	..	7,462	6,563 87·95%	899 12·05%	756	655 86·64%	101 13·35%
Gayndah	17,458	16,039 91·87%	1,419 8·13%	..	7,943	7,550 95·05%	393 4·94%	369	247 66·93%	122 33·06%
Chinchilla	22,742	15,611 68,64%	7,098 31·21%	33 ·14%	7,385	6,467 87·57%	918 12·43%	1,246	893 71·67%	353 28·33%
Toowoomba	15,832	15,500 97·90%	332 2·1%	..	6,020	6,020 100%	..	619	619 100%	..
Clifton	10,197	9,561 93·76%	636 6·24%	..	12,333	12,299 99·72%	34 ·27%	583	574 98·46%	9 1·54%
Crow's Nest	20,620	17,297 83·88%	3,323 16·11%	..	8,948	8,728 97·54%	220 2·45%	30	30 100%	..

PRODUCTION PAYMENT AND GRADINGS OF BUTTER IN QUEENSLAND FOR THE YEAR ENDED 30TH JUNE, 1943—*continued.*

Factory.		Manufacture and Payments in Lb.					Overrun.		
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Make Graded.
									Per cent.
Dalby	Make	3,203,843	1,542,099	1,540.616	121,128	..	89,085 lb.	91,135 lb.	92·904
	Pay	3,205.893	1,539,667	1,559,075	107,151	..	2·85%	2·92%	
Goombungee	Make	1,595,664	935,200	660,464	..	..	57,290 lb.	57,266 lb.	90·626
	Pay	1,595,640	934,809	660,774	57	..	3·72%	3·72%	
Jandowae	Make	2,375,072	1,410.024	936,208	28,840	..	80,826 lb.	80,839 lb.	99·313
	Pay	2,375,085	1,410,689	936,035	28,361	..	3·52%	3·52%	
Miles	Make	1,377,380	257,320	1,050.784	69,276	..	45,291 lb.	45,544 lb.	87·351
	Pay	1,375,633	257,003	1,051,317	67,313	..	3·4%	3·42%	
Killarney	Make	1,441,480	808,012	620.140	13,328	..	28,745 lb.	27,696 lb.	66·385
	Pay	1,440,431	807,698	620,770	11,963	..	2·03%	1·96%	
Millmerran	Make	1,284,383	185,538	948,080	150,765	..	31,949 lb.	31,823 lb.	95·755
	Pay	1,284,257	234,581	937,235	112,441	..	2·55%	2·54%	
Oakey	Make	3,245,756	2,401,332	597,744	256,680	..	102,593 lb.	104,929 lb.	91·18
	Pay	3,248,092	2,352,801	716,159	179,132	..	3·26%	3·33%	
Roma	Make	999,598	33,667	725,859	240,072	..	22,685 lb.	22,462 lb.	47·081
	Pay	999,375	299,974	495,177	204,224	..	2·32%	2·29%	
Warwick	Make	2,066,315	1,502,787	503,552	59.808	168	58,304 lb.	52,783 lb.	50·882
	Pay	2,060,794	1,477,064	539,642	44,088	..	2,903%	2·62%	
Allora	Make	1,619,333	1,187,698	430,448	1,187	..	40,085 lb.	43.233 lb.	76·599
	Pay	1,622,485	1,194,026	423,647	4,812	..	2·53%	2·73%	
Texas	Make	212,071	158,543	30,706	22,822	..	6,891	7,408 lb.	24·901
	Pay	212,588	100,812	89,520	22,256	..	3·35%	3·61%	
Inglewood	Make	483,448	273,336	193,256	16,856	..	15,670 lb.	16.284 lb.	66·709
	Pay	484,062	204,949	262,875	16,238	..	3·34%	3·48%	

PRODUCTION PAYMENT AND GRADINGS OF BUTTER IN QUEENSLAND FOR THE YEAR ENDED 30TH JUNE, 1943.—*continued.*

Factory.	Official Gradings in Boxes.									
	Submitted as Choice.				Submitted as First.			Submitted as Second.		
	Total.	Choice.	First.	Second.	Total.	First.	Second.	Total.	Second.	Pastry.
Dalby	22,968	21,912 95·40%	1,056 4·59%	..	28,033	27,790 99·13%	243 ·86%	2,133	1,763 82·65%	370 17·34%
Goombungee	14,127	12,969 91·80%	1,158 8·19%	..	11,694	11,694 100%	..	2	2 100%	..
Jandowae	24,782	23,692 95·6%	1,090 4·4%	..	16,816	16,700 99·31%	116 ·69%	523	477 91·2%	46 8·79%
Miles	1,926	1,860 96·57%	66 3·43%	..	18,455	18,414 99·78%	41 ·22%	1,104	1,035 93·75%	69 6·25%
Killarney	5,239	4,360 83·22%	879 16·77%	..	11,609	11,286 97·21%	323 2·78%	240	230 95·83%	10 4·17%
Milmerran	2,298	1,841 80·11%	447 19·45%	10 ·43%	17,056	16,014 93·89%	1,042 6·11%	2,608	2,284 87·57%	324 12·42%
Oakey	37,733	29,367 77·82%	8.366 22·17%	..	10,713	10,356 96·66%	357 3·33%	4,402	4,210 95·63%	192 4·36%
Roma	..	..	..	..	4,399	4,367 99·27%	32 ·73%	4,005	3,996 99·77%	9 ·22%
Warwick	9,400	7,916 84·21%	1,484 15·78%	..	8,335	8,254 99·02%	81 ·97%	1,040	996 95·76%	44 4·23%
Allora	14,259	11,476 80·48%	2,782 19·51%	..	7,791	7.407 95·07%	384 4·92	101	23 22·77%	78 77·22%
Texas	..	..	..	..	536	463 86·38%	73 13·62%	407	374 91·89%	33 8·11%
Inglewood	2,241	1,829 81·61%	412 18·38%	..	3,217	3,217 100%	..	301	301 100%	..

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock, which have qualified for entry into the Advanced Register of the Herd Books of The Australian Illawarra Shorthorn Society, the Jersey Cattle Society and the Ayrshire Cattle Society. Production records for which were compiled during the month of September, 1943 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Yarranvale Lovely (208 days)	W. Henschell, Yarranlea	7,802·75	290·022	Trevor Hill Bosca
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Penrhos Janet	A. Sandilands, Wildash	6,404 81	266·463	Penrhos Pansy Prince
JUNIOR, 2 YEARS (STANDARD, 230 LB.).				
Sunlit Farm Ollie	W. H. Sanderson, Mulgeldie	6.225 25	253 183	Sunlit Farm King Billy
JERSEY.				
JUNIOR, 3 YEARS (STANDARD 270 LB.)				
Gem Leila	W. Bishop, Kenmore	6.599 95	343·886	Calton Lothean
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Hocknell Waimate Barleycorn	N. C. Webb, Beaudesert	7,155 7	332 607	Hocknell Golden Surprise
Mayfair Bluebell 3rd	J. Carpenter, Flagstone	5,266·2	295·464	Trecarne Victory
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Hocknell Peer's Sweetheart	N. C. Webb, Beaudesert	5,637 0	309 196	Carnation Hopes Robin
Elwyn Golden Queen	E. J. Dunning, Stanmore	5,617 4	285·681	Glenside Lone Star
Mayfair Beauty 4th (257 days)	J. Carpenter, Flagstone	5,175 1	260·667	Trecarne Victory
AYRSHIRE.				
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Leafmore Sonya	J. P. Ruhle, Motley	5,826 4	267 243	Myola Jellico
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Leafmore Bonnie Bess	J. P. Ruhle, Motley	7,111·75	282·776	Myola Jellico

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock, which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society, production records for which were compiled during the month of October, 1943 (273 days unless otherwise stated).

Name.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORN.			
	JUNIOR, 3 YEARS (STANDARD 270 LB.)			
College Mayflower 6th	Queensland Agricultural High School and College, Lawes	8,301·1	349 291	Hillview Premier 2nd
Sunlit Farm Poppy	W. H. Sanderson, Mulgeldie	7,518 6	297 522	Sunlit Farm King Billy
	SENIOR, 2 YEARS (STANDARD 250 LB.)			
Rosenthal Choice 17th (365 days)	S. Mitchell, Warwick	9,442·53	395·689	Rosenthal Perfection
	JUNIOR, 2 YEARS (STANDARD 230 LB.)			
Mountain Camp Charm	W. Caldwell, Bell	6,346 59	288 453	Rosenthal Red Major
Mountain Camp Fancy	W. Caldwell, Bell	5,497·15	235·982	Rosenthal Red Major
	JERSEY.			
	SENIOR, 4 YEARS (STANDARD 330 LB.)			
Boree Clover	W. and C. E. Tudor, Branch Creek	8,781·5	415·061	Boree Soldier Boy
	JUNIOR, 4 YEARS (STANDARD 310 LB.)			
Boree Harebell	W. and C. E. Tudor, Branch Creek	6,443 86	326 967	Boree Soldier Boy
	JUNIOR, 3 YEARS (STANDARD 270 LB.)			
College Holly	Queensland Agricultural High School and College, Lawes	7,096·65	363 777	Richmond Stalworth
	SENIOR, 2 YEARS (STANDARD 250 LB.)			
Gem Noreene	W. Bishop, Kenmore	5,776·15	320·263	Gem Sir Neville
	JUNIOR, 2 YEARS (STANDARD 230 LB.)			
Glenview Xenia Watnot	F. Eager, Petrie	4,625·76	242·454	Trinity Governor's Hope

The PIG FARM

More Pig Meats Wanted.

E. J. SHELTON, Instructor in Pig Raising.

A NOTED British authority, Sir John Russell, has said of the brood sow in relation to other farm stock:—

> "Beef has always been the Englishman's favourite meat, but it is extravagant to produce, for the bullock is a poor transformer of food into flesh and still worse when he is making the prime beef of peace-time.
>
> "Sheep are better transformers, but the pig is the best of all. Considered merely as a machine for making meat, the pig wins easily. But she (pigs are mostly feminine or neuter) suffers from one fatal defect: she is much nearer the human being in structure and in food requirements than are cows or sheep, she has only one stomach, is not well adapted to feed on grass or on what farmers call roughage, i.e., straw, hay, &c., but needs grain if she is to do well, and, of course, some green food. . . . In short, she eats the same food as we do, although she accepts a lower standard."*

In Queensland, pig raising has always been closely allied to dairying, yet the production and marketing of pigs as a specialised rural industry has proved profitable on all farms where pig raising is conducted as a business on approved lines; on farms which are not run by guesswork, but where attention is given to every detail.

Bacon curers, meat exporters, and, most important of all, the nation want more pigs, and farmers themselves want more pigs. The Stud Pig Breeders' Society has as its slogan "Better Pigs on Every Farm," which to-day might be reset and worded "More and Better Pigs on Every Farm."

Breeding and Feeding.

In pig keeping, as in other farm industries, there is a right and there is a wrong way in the feeding and management of livestock, and the farmer has to be up-to-date in his ideas and in his practice; he needs to adopt the "right" way if results are to be up to expectation. The farmer who dilutes skim milk (which itself contains more than 90 per cent. water) "fifty-fifty" with added water and expects the pigs to make satisfactory growth is so much out-of-date that he is being superseded automatically by more enlightened farmers whose knowledge of food values and of nutritional factors, while not yet complete, is being

* *Britain's Food in Wartime*, by Sir John Russell.

built up and added to in a variety of ways. This view is expressed after correcting the answers to several hundred "Section Answers" sent in by Queenslanders taking the free correspondence course of instruction in pig raising conducted by the Department of Agriculture and Stock.

Altered Demands of the Trade.

With changing wartime demands, there has come about a notable change in trade requirements which need some further explanation. Farmers have been asked by those in charge of the food production campaign to increase pig production by 30 per cent., or more, above normal averages; and to do this in quick time the maximum dressed weight of bacon pig carcases has been lifted to 200 lb., which is roughly 270 lb. live weight, "a heavy baconer"; the weight range being from 100 lb. dressed (145-150 live weight) to 200 lb. The guaranteed price has been fixed for first grade at 9d. per lb. at export port, which is equal to between 8½d. and 8¾d. at farms or country centres. For other grades, the price is lower.

There has been an appreciative response to the appeal for increased production, which, however, started on its way with the handicaps of man-power shortage, shortage of and difficulty in procuring building and fencing material, shortage of meat meal and similar protein-rich concentrates, plus high-priced grain, and for quite a long period unfavourable weather, now fortunately ended.

The Pig Feeders' Problems.

Under the Commonwealth Pig Meat Acquisition Scheme, the price to be paid for bacon pigs has been fixed and guaranteed for some time ahead, and apparently there is no intention of departing from this fixed scheme, which provides for payment to the farmer on the basis of grade—the grade specifications being very similar to those operating when frozen carcases were being exported in large quantities.

Of the problems the farmer has to face, one of the most important is how to top-up this heavy weight bacon pig without resultant carcase being degraded as overfat. This problem is greatly simplified if farmers will avoid shutting the pigs up in small sties for fattening during the three or four weeks before marketing. The advice given in this respect is to finish (or top up) the baconers in open yards, areas sufficiently large to permit of some grazing and ample exercise in the sunshine. Those farmers who have adopted this system are already obtaining better results and better grades.

Then the amount of maize or other grain should be restricted so that instead of the pig gorging and then sleeping off the after effects, the animal is always anxious for its food, and thus takes ample exercise grazing on succulent pasture.

Similarly, it is preferable to allow the animals a smaller quantity of skim-milk (pure) or similar product and plenty of clean drinking water and mineral matter like charcoal and wood-ashes.

Labour-saving practices also are important, and farmers who prepare a balanced grain meal—maize meal or wheat or grain sorghum meal plus meat or bloodmeal, plus lucerne chaff—and feed this mixture in dry form after the pigs have cleaned up their milk, report excellent results; this system is certainly cleaner and obviously less wasteful.

Unless for special reasons on individual farms (like those feeding food scrap and similar garbage), there is no payable advantage in cooking or even in soaking grain or meal, and at butchers' slaughter yard piggeries this feeding of grain or meal in dry form is advocated, the soup, of course, being a boiled product.

Greater use should be made of green food—inclusive of grass—and root crops; and those crops which can stand over for a lengthy period without undue deterioration are worth special attention. It has been emphasised over and over again that the secret of success lies largely in the production and utilisation on the farm of as much of the food supply as is possible.

Breeding.

There is a right and there is a wrong type of pig, just as there is a right and a wrong system in feeding and management. It is not urged, nor is it desirable, that farmers should immediately set about changing the type of pig they are breeding unless there is a specific reason for so doing.

Departmental officers are willing and prepared to report on the suitability of farmers' pigs if and when opportunity offers for so doing. Similarly, factory managers have expressed their willingness to supply detailed reports on the condition and usefulness of farmers' consignments. And as there is an appreciable difference in the price paid for the various grades, with top price for first grade only, there is no reason why farmers should lose money on the marketing of their pigs, if they are in the right condition and of the most desirable weight and type.

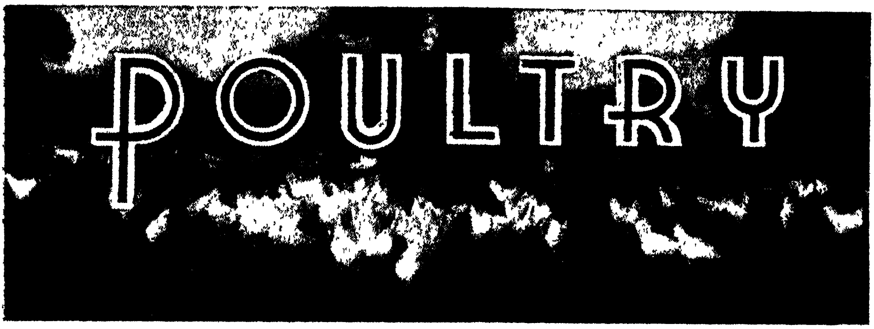
All these points are worth following up with a view to increasing pig production to the maximum to meet heavier demands of the Services as well as civilian requirements.

Farmers having difficulty in relation to their pigs are invited to communicate with the Department, so that suitable action can be taken to go fully into their pig-meat production problems.

PIG-TRUCKING POINTS.

The raising of first-grade top-weight pigs to 200 lb. dressed weight necessarily limits truck loadings as follows:—FP truck, no more than 24 to 26 pigs; L truck, 48 to 52 (24 to 26 on each deck); MGP truck, 80 to 86 (40 to 43 on each deck). Should any extra heavy baconers be included, i.e., pigs dressing 180 lb. or more, numbers should be further reduced. For choppers, the allowance should be on the basis of one chopper being equal to two average baconers. Bacon factories prefer to have pigs held back for a later trucking rather than run the serious risk of losses through overloading. Moreover, pigs should never be allowed to become overheated, and should always be unloaded by way of a race. Feeding pigs before trucking should be avoided, as it has been found by experience that this causes sickness in transit often with fatal results.

Because of the greatly increased demand for all classes of meat, it is imperative to prevent avoidable losses of animals through overloading or any other cause.



Marketing Eggs.

P. RUMBALL, Poultry Expert.

TO too many farmers, the egg is just an egg, and little thought is given to its quality. The producer should not lose sight of the fact that the hen provides a highly nutritious food in a convenient form, specially wrapped and sealed within a shell, although of a highly perishable nature.

A brief outline of the structure of the egg and the various causes of depreciation in quality, it is hoped, will make for better care in handling.

The Yolk.

The yolk is the first part of the egg to develop. This occurs in the ovary, where numerous yolks are situated in various stages of development. Each yolk is enclosed in a sac, which, when the yolk is mature, ruptures along the non-vascular area, releasing the yolk into the oviduct. Occasionally this rupture extends beyond the non-vascular area, causing bleeding from one of the small blood vessels of the yolk sac, with the result that the yolk is released with a clot of blood. The presence of blood with the yolk renders the egg unmarketable because of its appearance. When a producer collects a high percentage of such eggs, he should examine the system of feeding. Over-stimulating foods are suggested as the probable cause, and if an examination of the whole ration supplied indicates that the protein content exceeds 15 per cent., the crude protein content should be reduced to that level.

The colour of the yolk is influenced by feeding, and may vary from a pale straw colour to a deep orange red. The colour most sought after is that of a good golden yellow, and breeders who are producing pale yolks may improve colour by feeding yellow maize and green feed.

How the Whole Egg is Formed.

As the yolk passes down the oviduct, it gathers several layers of albumen. The first is a layer of dense albumen and the formation of what is termed the chalaza. The chalaza is that thickened, twisted mass of albumen that may be noticed when an egg is broken into a dish, extending from the yolk on opposite sides. The chalaza is intended to keep the yolk more or less centred in the egg. Passing further down the oviduct, the second layer of albumen is laid on; this is not so dense as the first. Then another layer of thinner albumen, followed by the two membranes, and then lastly the shell is added. The shell is not laid on its solid form as seen, but by the accumulation of lime salts

in more or less a semi-liquid form which becomes hardened before the egg is laid. Naturally there are minute pores between the particles in the shell-forming material.

Protective Coating on the Egg.

Nature, as a further protection, coats the egg with a gelatinous material before it is laid. This coating is frequently referred to as the "bloom" of the egg, and if the egg could be carefully collected from the hen when laid, and allowed to dry, one would have then the best possible product to handle, and if given the correct subsequent treatment, there would be little cause for complaint as to quality. This, however, is not possible under commercial conditions, but it would be as well at the outset to realise that the less removal of the protective coating the better is the keeping quality of the egg, and therefore the producer should do all he can to maintain the egg in its nearest approach to that as laid and realise that until some protective medium is found, which may be added to any fluid used for washing eggs without detriment to the egg, that such washing renders the egg more susceptible to deterioration.

Factors in Egg Quality.

The poultry raiser has three principal factors to give consideration to in the protection of the egg quality—

(1) Fertile eggs;

(2) Soiled eggs;

(3) The effect of heat on the egg.

There are other influences to which eggs may be exposed which affect quality—namely, the attack of moulds and bacteria. These influences, however, are not common where the best possible conditions for production have been followed.

The production of fertile eggs should be avoided as far as possible. Although incubators are operated at a temperature of 100 deg. Fahr., it does not need a similar temperature to commence the development of the germ, and in the height of summer it is almost impossible on many farms to keep eggs at a sufficiently low temperature to prevent some form of cell division taking place with fertile eggs, for once embryonic development has advanced to any degree and stops, decomposition soon follows.

In these circumstances, roosters should not be allowed to run with the flock, excepting during the breeding period.

The next condition to guard against is the soiling of eggs within the nests. Naturally, plenty of clean nests, sufficiently roomy for the bird, should be provided. In these nests it is essential to have some form of material to make the nest comfortable and attractive to the bird, to protect the egg from being broken and from becoming soiled. Many egg producers use old butter boxes for nests. These, in size, are very suitable, and in planning any form of nests, the butter box could be used as a guide for size.

Various forms of nesting materials are used, such as straw, shavings, sawdust, and shell grit. Shavings and sawdust are very absorbent, and not scratched out of the nest to the same extent as straw, and because of their fineness, are more absorbent, and have a greater cleansing effect on the feet of the birds, thereby preventing, to some extent, the soiling of eggs. If sawdust or shavings are used, pine-wood residues

should be chosen, as many hardwood sawdusts stain the shell of the egg. Shell grit is a reasonably good nesting material, naturally not so absorbent as sawdust, but too expensive for use.

The frequency with which eggs are gathered has a very marked effect on their cleanliness, and, more than that, on the labour entailed in preparing the eggs for market. Three gatherings a day should be the rule on most farms, particularly when production is at its height, and several birds are visiting each nest daily. When production is slack, the gathering of eggs may be reduced to twice daily. Not only does the frequency with which eggs are gathered assist in keeping the eggs clean, it protects also against breakages, and the possible development of the vice of egg-eating.

The Effect of Heat on the Egg.

Heat hastens the evaporation of the moisture contained in the egg, enlarging the air cell. The albumen also becomes thinner, and the yolk more visible when candling, and instead of being retained in a more or less central position it becomes "sided," and at times attached to the shell. It does not require a very high temperature to cause this breaking down, and it has been found that a temperature over 60 deg. Fahr. is conducive to rapid deterioration of quality. In fact, temperatures of 68 deg. Fahr. have been known to stimulate embryonic development; therefore the coolest position on the farm should be sought for the storage of eggs pending transport to market. Further protection of the egg against excessive heat is given by frequent gatherings, as it prevents their being reheated by the visits of several other birds to the nests.

Moulds and Bacterial Infection.

Mould invasion of eggs is not uncommon in Queensland, particularly during the humid weather which prevails in the early part of the year. Mould growths have been traced to the ordinary brown strawboard fillers frequently used, and also to nests in which mouldy grass or straw has been used for litter.

Humid conditions are conducive to the development of moulds, which enter the eggs through the pores of the shells, causing them rapidly to develop into what is known as black rots. Protection is given by using only sweet and dry nesting material, by keeping the cases and fillers used for packing quite dry, and by never packing eggs with shells still moist.

Packing.

The practice of using chaff and similar materials has, for packing, fortunately, largely ceased with the more extended use of the standard case and fillers. Many producers, however, with the object of giving greater protection to the egg, use chaff and material of a like nature in the bottom, and frequently the top of the cases. This is not recommended. As well as causing the eggs to become dusty in appearance, the practice exposes the egg to infection by moulds. If it is at all necessary to use anything as a filler in the case, crumpled paper is preferable.

The standard 30-dozen case, as now used by the Queensland Egg Board, obviates the necessity for any further protection, and is definitely recommended to all producers as the best means of packing eggs for market.

ANIMAL HEALTH

Rearing Dairy Calves.

G. R. BRETTINGHAM-MOORE.

THE arrangement and function of the stomach of the newborn calf should be understood so that an intelligent appreciation of the essentials of calf-feeding may be grasped.

Though the four stomachs of the adult animal are present, their relative sizes are quite different at birth and for the first twelve days only the fourth or true stomach is functional.

The table below makes the relation clear—

RELATIVE CAPACITY OF PARTS OF THE RUMINANT STOMACH.

—	Rumen and Reticulum. 1st Stomach. 2nd Stomach	Omasum. Bible.	Abomasum. 4th Stomach.
	%	%	%
At Birth	30	5	65
At Maturity	85	7	8

It is thus apparent that at birth the capacity of the fourth stomach is about twice that of the rumen and reticulum combined. At maturity the rumen and reticulum together are approximately ten times the size of the true stomach.

The development of the stomach of the newborn calf can be divided into three stages—

1. First Two Weeks.—The fourth stomach alone is working and only liquid food can be digested;
2. Third Week.—Transition, while the rumen and reticulum gradually develop. A little "picking" is taken;
3. Fourth Week.—Development of rumination and solid food taken in ever-increasing quantities.

Though the rumen does not begin to function till the third week it has been found experimentally that if cold milk—*i.e.*, below blood heat of 101 deg. Fahr.—is fed, some finds its way to the rumen. As it cannot be digested there and cannot escape it decomposes, forming a breeding ground for harmful bacteria, thus favouring the development of white scours.

Though the fourth stomach is the largest it is relatively small, as the suckling calf feeds naturally 12–18 times a day. If too few feeds are permitted the calf will overeat, leading to indigestion and a further predisposition to scours.

Vitamins.

Vitamin A.—Calves are born deficient in Vitamin A, which is best supplied by the colostrum. It is present in whole milk but not in skim.

Vitamin B.—Up to the third week the calf can only obtain the supply it needs from whole milk. With the beginning of rumination it is formed by bacterial action in the rumen.

Vitamin C.—Is abundant in newborn calf but becomes depleted in the first twenty-four hours and from then till the third week must be supplied by whole milk.

Vitamin D.—Is of little importance in the early stages and later on is manufactured by the animal in sufficient quantities.

Water.—From an early age the calf needs water, and when rumination begins the supply required daily soon becomes considerable as it is estimated that a calf requires 3 to 4 lb. of water for every 1 lb. of dry food consumed.

In an experiment with calves, one group (A) received water and milk and the other (B) only milk, each getting 14 lb. of milk a day and as much hay as they would eat. The (A) group consumed as much water as milk daily and twice as much hay as group (B) and over the period of the experiments gained 0·44 lb. per day more than (B).

Importance of Colostrum.

Colostrum is the name given to the milk secreted for the first few days after the birth of the calf. For the first five to seven days the mother's milk is of quite different composition from normal milk. It contains certain substances which make it unsuitable for human consumption and yet are essential for the young calf and cannot be provided from any other source.

COMPOSITION OF COLOSTRUM MILK AND ITS DERIVATIVES.

—	Water	Minerals.	Protein	Carbohydrate	Fat.
Colostrum ..	74·5	1·6	17·6	2·7	3·6
Whole Milk ..	87·0	0·7	3·3	5·0	4·0
Skim Milk ..	90·5	0·7	3·4	5·1	0·3
Butter Milk .	91·0	0·8	3·5	4·2	0·5
Whey	93·4	0·7	0·8	4·8	0·3

Besides being laxative and of high protein content it contains vitamins and special bodies called antibodies, which confer a certain immunity against disease before the calf can build up its own resistance. The ability of young animals in the womb to receive from the maternal blood stream the antibodies they require for protection in later life varies with different types of placenta. Those in which the contact is very close, as in the bitch, do receive their antibodies in this way. In others, such as cows and ewes, the contact is less intimate and the young depend on the colostrum for these substances. For the first three weeks, then, we can summarise the following essentials of calf-feeding:—

1. The calf must have the colostrum.
2. All food must be fed at blood heat.

3. Feeds must be as frequent as possible, say, four times a day for the first week, three times daily for the second week, and twice daily for the third week. This is the very minimum that is permissible. Thereafter, it should not be less than twice daily up to three months, when a sturdy calf will do satisfactorily on solid food alone, though milk can be continued much longer than this with benefit.
4. Up to three weeks the calf should have whole milk. If this is impossible, skim milk and properly compounded calf feed may be gradually substituted after the first week, spreading the process over at least ten to fourteen days.

Feeding.

For convenience, calf feeding may be divided into three periods.

First Stage—Birth to Three Weeks—Fifty-fifty Method.—There is much to be said for the system of running cow and calf together during the day for the three weeks period or part of it. The calf is removed at the evening milking and placed in a pen. After the morning milking it is put with the cow again. If the cow can see her calf through a fence she will not fret unduly, and the calf can be taught to drink from a bucket in the morning before going out with the mother, so that there will be no difficulty in taking to the bucket when weaned. The chief objections urged against this method are—

1. It is difficult to teach the calves to drink.
2. The cows fret too much and hold their milk.
3. The cost of whole milk.

Number 1 may be answered by adhering to the method described above, which also disposes of No. 2, as the cows readily forget about their calves in a week or two, even if they require to have them alongside for a few days to begin with while being milked. If No. 3 is examined it is found not to be very serious, and if a calf is worth keeping at all it must be well fed.

On the average for the first three weeks a calf will consume about 1 gallon of whole milk daily. As the first week's milk has no commercial value, the cost of feeding the calf on whole milk for the first three weeks works out as the cost of 14 gallons of whole milk. Not only will this method practically insure a healthy batch of calves, but it saves cleaning calf utensils and warming the milk for that time, and is almost certainly better for the cow, as there is good reason for believing that the pummelling that the calf gives the udder during suckling is beneficial for that organ. During its life in the womb the large amount of blood required for the nourishment of the calf is supplied by the mother to the fetal membranes. At birth the flow is suddenly cut off and diverted to the udder for the secretion of milk, and the calf "massage" is valuable in facilitating this change over. If this ideal of three weeks cannot be arranged, at least the first week should be insisted upon.

It is realised that this plan will meet with strong opposition from many dairymen, and if they are raising healthy calves by other methods there is no need to make a change. But, on all too many dairy farms, large calf losses are being experienced, and the survivors are sickly and stunted. In some cases the whole year's drop of heifers is lost, and in nearly all the damage is due to departure from one or other of the above-mentioned essentials, and is preventable.

Bucket Feeding.—If this method is resorted to the calf must have the colostrum for the five to seven days while it lasts, and after that should have its mother's milk or, at any rate, milk from a recently calved cow. The reason for this is that in the early stages of lactation the curd is softer and more easily digested than in the latter stages, and if the young calf gets milk from a cow that is towards the end of her milking period, digestive troubles may arise. For the rest, the milk must be clean, warm, and fed as frequently as possible. About a gallon a day is the average consumption; less for the small breeds, and more for the larger. Children are usually more adept at teaching calves to drink because of their smaller hands. Clean water must be available in troughs, and a shady, dry yard and pen provided. A calf bail greatly facilitates feeding.

Second Stage—Three Weeks to Three Months.—At three weeks the calf presents no problem if left with its mother on the half-time plan, but this is not economical, and should only be resorted to in special circumstances such as stud cattle or shortage of labour. Skim milk, butter milk, calf meal, or a mixture of these must be substituted for the whole milk by a gradual process spread over ten to fourteen days. The quantity required per day may be estimated on the basis of 1 lb. per 10 lb. body weight, and good grass or hay should be available and water in troughs. The foam on skim milk has been found to cause mild bloating, but is believed to have no permanent ill effects.

Calf Meal.—At present these are difficult to obtain, but the farmer may make up his own mixture as follows:—

Cereal Meal	50 parts
Meat Meal	40 parts
Bone Meal	5 parts
Coarse Salt	5 parts

Making a trough of this meal available to the calves tends to stop them sucking each other and thus prevent malformed udders. If a handful is put in the bottom of the bucket for a few days they develop a taste for it and will help themselves from the trough between meals.

Buckets or Nipples.—Buckets are easier to keep clean and are in the long run more satisfactory than nipples for this reason.

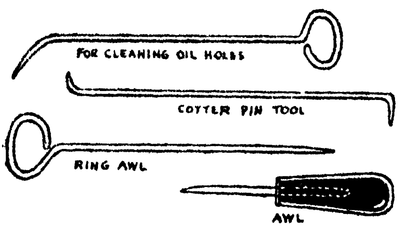
Third Stage—Three Months and Over.—If skim milk or butter-milk are available they should be fed as long as possible. On good green grass little else is necessary, but if the grass is dry lucerne hay should be supplied. Roughages such as silage and chaffed cane are insufficient in themselves, and what they lack can to some extent be made up by supplying a lick as follows:—

Sterilized Bone Meal	30 parts
Coarse Salt	30 parts
Meat or Blood Meal	30 parts

This must be put out in covered troughs so that the weather cannot affect it.

Normal Rate of Gain.—Dairy calves properly fed gain weight rapidly. As a guide it may be said that they should gain 1 lb. per day for the first three months, and at least 1¼ lb. per day in the first six months.

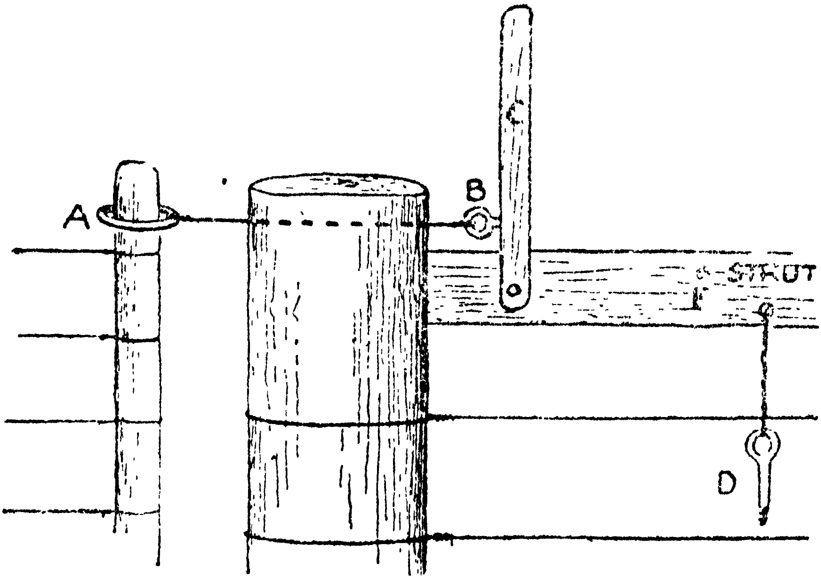
GADGETS AND WRINKLES



TOOLS FROM FORK TINES.

Most farms have a broken old fork or two in the scrap pile. Here are some useful tools that can be made in a few minutes from the tines. The one for cleaning out oil holes is better than a piece of wire. The cotter pin tool is useful in many ways. The awls are very useful in the workshop for making small holes and scratching lines on metal or tin. If you have no forge you can heat the tines in the stove and bend them.

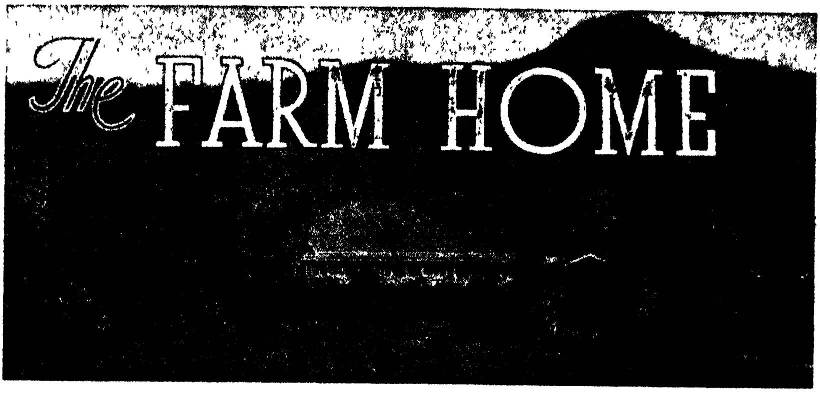
A QUEENSLAND GATE FASTENER.



The Queensland gate usually consists of four or five strands of barbed wire fastened to one post of a gateway, and, at the other end, attached to piece of round timber 4 or 5 ft. long. The gate, when closed, is kept in position with length of wire attached to a stick. This illustration is an adaptation of the principle which is an improvement on the usual lever job.

A is metal ring big enough to fit over gate upright. From the ring a chain or length of twisted wire passes through a hole bored in strainer post to an eye-bolt B fixed in a strong lever C.

When lever is pressed down gate is drawn taut. Another eye-bolt D hangs on a length of chain when not in use, and is plugged into hole E to keep the lever down when gate is closed.



Care of Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

SUMMER HOLIDAYS AND THE CHILDREN.

SUMMER is approaching and school holidays will soon be commencing, so Queensland's fresh air and sunshine should be used to the best advantage for the children's health. Sunshine properly used will build up the children's resistance to sickness and bring colour to their lips and cheeks as well as a nice tan to their limbs and bodies. Best of all, it will help to build up strong bones and teeth by assisting their bodies to use the lime and phosphorus in their foods. So whether at the seaside or in the home yard or garden, the children can obtain benefit from their holidays. Some sort of a shelter could be built in the corner of the yard—boys will love to make a wig-wam and be Red Indians, or a tent and be explorers or soldiers, and the girls these days will assume equal rights to be any of these things also. Allow them to eat lunch outside in their camp, and do try not to mind if the place is rather untidy for a while as long as the children are happy. Baby can lie in his play-pen under a shady tree, or if he is old enough to sit up how he will enjoy watching the others play!

Children should have a minimum of clothing—sunsuits or sleeveless shirts and shorts and shady hats, but if they have not been accustomed to so much sun, the exposure must be very gradual. Baby will respond to sunbaths too and mother and baby can have theirs at the same time. They can sit on the verandah or on the lawn in the sunshine—shady hats on both—and the baby's legs exposed to the sun for say five to ten minutes before the 10 a.m. feeding, and, in the course of another week or so, before the 2 p.m. feed also. By slow degrees the sunbath may extend to the waist and later to the arm pits. Let him kick in the sun before or after his bath and give him stimulation and passive exercise by stroking the legs and arms gently but firmly, starting at the hands and feet and working towards the trunk. This increases the activity of the circulation. If the baby has a fine sensitive skin and reddens instead of tanning, his sunbaths must be taken very slowly, commencing with only one or two minutes until the skin can be educated to re-act properly.

If the mother wears a short sleeveless frock and no stockings she can obtain quite a lot of benefit herself from her baby's sunbaths—and also have a few minutes rest and relaxation.

If living in flats or rooms with no yards or gardens, the baby's sunbaths can be given in a sunny room or verandah, provided the windows are wide open; and then there are public parks or gardens for the children's sun and air baths. Watch for next month's article when a few special summer time "Do's and Dont's" will be listed.

Questions on this and any other subject concerning maternal and child welfare will be answered by communicating personally with Maternal and Child Welfare Information Bureau, 184 St. Paul's Terrace, Brisbane, or by addressing letters "Baby Clinic, Brisbane." These letters need not be stamped.

IN THE FARM KITCHEN.

A Holiday Mixture.

Fresh Pea Soup.

Cook together 2 lb. shelled peas, 1 large sliced onion, a little chopped parsley, 2 cups boiling water, salt, pepper, 1 teaspoon sugar. Simmer until tender with a hambone, if liked. Remove bone and rub vegetables through a sieve. Melt 1 tablespoon butter in a saucepan, add 1½ tablespoons flour, cook a little, then add 1 pint milk, and, if liked, 1 tablespoon cream. Add vegetable puree and stir well together. Thoroughly heat and serve with sippets of toast or fried bread.

Baked Tomatoes.

Well grease a pie dish and put in a layer of tomatoes, peeled and cut into thick slices. Sprinkle with salt, pepper, a little sugar, and curry powder. Add a layer of tomato, a layer of well-boiled rice, then another layer of tomato. Cover top with buttered crumbs and bake slowly for half an hour. Serve with fingers of fried bread.

Custard Tart.

Line a sandwich tin or ovenproof tart plate with shortcrust and fill with the following:—Beat 2 eggs slightly, add 2 tablespoons sugar, vanilla, and 1½ cups cold milk. Rub bottom of pastry with egg-white and pour in custard very gently. Sprinkle top with a little nutmeg and place in hot oven for a few minutes, then lower heat a little and bake until pastry is set. Reduce the heat to slow and continue to bake until custard is set.

Steamed Apple Pudding.

Peel and chop 4 or 5 apples into dice. Melt 1 tablespoon butter in a saucepan, add apples, and fry a little, add 1 cup sugar and fry until apples change colour. In the meantime, sift 2½ cups plain flour with 2 teaspoons baking powder and a good pinch salt. Rub in 3 oz. margarine and 1 tablespoon sugar. Add enough milk to form a firm paste. Line a basin with paste, reserving enough for top. Fill with apples, and, if liked, a few raisins and a little minced mixed peel may be added. Cover with remaining paste, cover with buttered paper, and steam for 2 hours.

Banana Charlotte.

Line a round, buttered cake tin with fingers of buttered bread, taking care to overlap each other. Put a layer of sliced bananas in the bottom and cover with apricot jam, then a layer of banana, and so on, until the dish is full, piling it much higher in the centre. Cover with a layer of bread and butter, sprinkle with sugar, and bake in a hot oven for half an hour.

Christmas Pudding.

Take ½ lb. breadcrumbs, ½ lb. raisins, 1 oz. citron peel, 1 grated carrot, ½ lb. brown sugar, ½ lb. muscatel raisins (if procurable), ½ lb. shredded suet, 2 oz. lemon peel, 6 eggs, 2 nutmegs, ½ lb. currants, ¼ lb. orange peel, 3 oz. almonds, 6 oz. flour, 1½ gills ale, salt.

Mix the breadcrumbs, sugar, grated nutmeg, chopped raisins, cleaned currants, minced peels, and a pinch of salt together in a basin. Stir in the suet, then the blanched almonds. Add well-beaten eggs and remaining ingredients, without the ale. Beat for two or three minutes with a wooden spoon, then stir in the ale, cover, and leave for several days, stirring once daily. Pack into two buttered basins. Cover with buttered paper, then a floured cloth. Steam for seven or eight hours in a saucepan with boiling water coming half way up the sides. When required, cook for three hours, then turn out, sprinkle with vanilla sugar, decorate with a sprig of holly, and serve with brandy or rum custard.

Economical Christmas Pudding.

Take ½ lb. beef suet, ¼ lb. flour, ¼ lb. breadcrumbs, 6 oz. cleaned currants, 6 oz. stoned raisins (if procurable), ¼ lb. brown sugar, ¼ lb. cooked carrot, ¼ lb. cooked potato, 2 oz. candied peel (finely shredded), 1 teaspoonful salt, 2 tablespoonfuls brown treacle.

Rub the carrot and potato through a sieve. Mix together all the dry ingredients with the sieved carrot and potato, and this will require time, as it is not easy to mix them well without moisture. Last of all stir in the treacle, after warming it until it runs. Mix very thoroughly, and keep in the mixing basin several days, stirring the pudding every day. Then put into a large basin (well greased), cover with greased paper and thick dry paper over all, and steam for six hours. When reheating, allow two hours for steaming through. Serve with brandy (if procurable) sauce or custard.

A. H. TUCKER, Government Printer, Brisbane.